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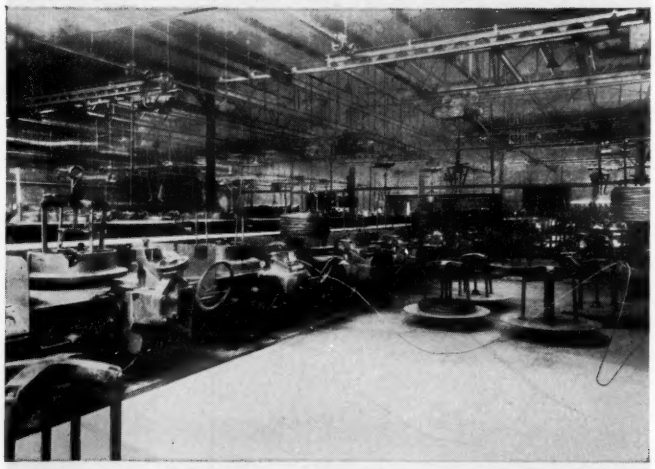

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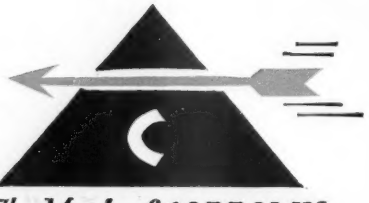

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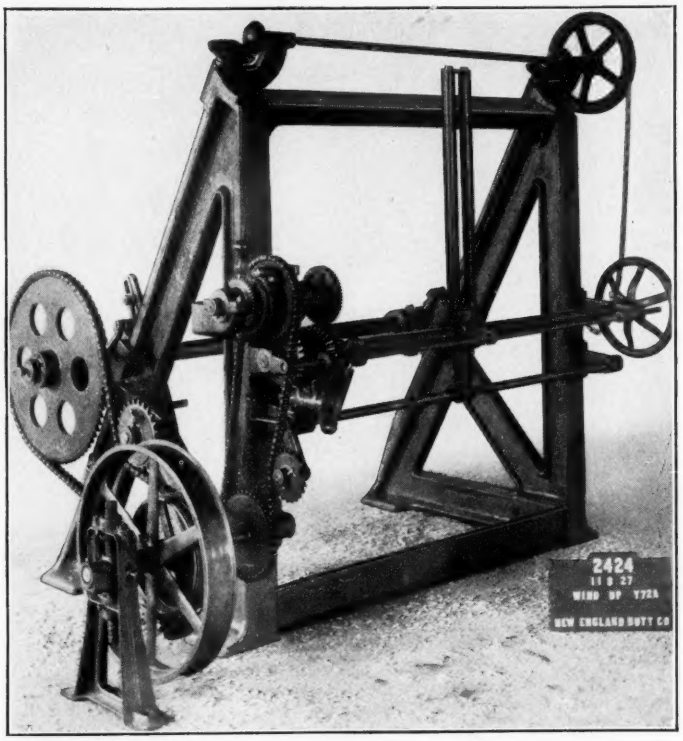

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Vol. 6 March 1931 No. 3

Official Publication of The Wire Association

Contents

Thermal Treatment of Wire ..... By F. T. Sisco 85
Annealing Cold-drawn Products—Patenting Includes Heating Above Critical Range with Accelerated Cooling to Form Large Grains of Pearlite or Sorbite.

Development of Wire Rope. Part III ..... By Percy R. Clark 88
Point Versus Line Contact—Pre-forming Methods and Results—Roumanian Petroleum Industry's Pump Ropes.

A New Market for Wire 90
The Inner-Spring Mattress Has M'ade the Bedding Industry an Important Consumer. Consuming More than 30,000 Tons Yearly.

Thyratron Tubes Maintain Tension as Wire is Reeled 91
New Tube Finds Practical Use in Wire-drawing, Applicable Also to Magnet Wire Spooling and Similar Work.

Many Oven Uses in the Wire Industry ..... By Philip Kriegel 92
Two pages of interesting pictures showing operating methods and conditions.

Wire Questions and Answers 94
A New Department in Which Problems of the Industry Are Presented and Solved as Far as Possible by Experts.

Standard Set for Galvanized Wire 102
Tentative Specifications referring to Various Zinc Coated Wire and Wire Products.

'Round the World with the Wire Industry 96

Outstanding Personalities of the Wire Industry 98

A Review of Recent Wire Patents 99

Exports and Imports of Wire 103

New Wire Machinery and Equipment 104

Buyers' Guide 117

Professional and Engineering Directory 118

Morris A. Hall, Editor

Associate Editors

L. D. Granger W. H. Spowers, Jr., Consultant on Galvanizing

Lancaster, Allwine & Rommel, Consultants on Patent Information

European Correspondents

Great Britain
A. C. Blackall
7 Vincent Sq. Mansions
London, S. W. 1, Eng.

Germany & Belgium
Paul Fidrmuc
Chapeaurougeweg 15
Hamburg, Ger.

R. E. Brown, Business Manager

Executive and Editorial Offices:
551 Fifth Avenue, New York City. Telephone: Murray Hill 10191

Western Rep.
Fred W. Swanson,
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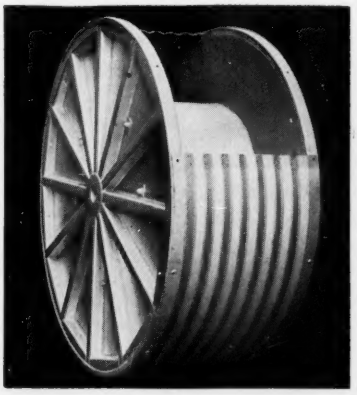

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Vol. 6 MARCH, 1931 No. 3

Thermal Treatment of Wire

By F. T. Sisco*

Annealing Cold-drawn Products—Patenting, Includes Heating Above Critical Range with Accelerated Cooling to Form Large Grains of Pearlite or Sorbite ▼ ▼ ▼

OF ALL cold-worked steels, a very large percentage is drawn directly from the hot-rolled bar or rod, with the exception of such process annealing as may be necessary to restore the ductility so that cold drawing can be carried further. However, there is a large class of cold-drawn products known as high strength wire, which is very important although of relatively small tonnage. Among these may be mentioned spring wire, rope wire, music wire and the like. In the manufacture of this special or so-called high strength wire some form of heat treatment either before, during or after cold working may be an important factor. This heat treatment may include normalizing, patenting (sorbitizing), hardening, or tempering, either alone or in combination as may be necessary to secure the properties desired.

The heat treatment operations that are used in the wire industry and will, consequently, receive our special attention, include annealing below the critical range, patenting, and the heat treatment of spring wire which is known in the wire mills as oil tempering. In general the processes of normalizing, annealing above the critical range, hardening and tempering as applied to cold-worked steels, if used at all, are but little different in procedure than these same operations applied to hot-rolled, forged or machined sections. For example, normalizing is occasionally necessary for hot-rolled rods which are to be drawn into high strength wire, in order to remove rolling strains and the slight heterogeneity of structure that sometimes is encountered in hot-rolled steel. Galvanizing, although not strictly a process of thermal treatment is, when used for high strength wire, actually a tempering operation and has a noticeable effect upon the physical properties. For that reason it will be described briefly.

*Editor, Alloys of Iron Research, New York. Former chief, metallurgical laboratory, Air Corps, War Dept. Wright Field, Dayton, O. Slightly abstracted from *Transactions, A. S. S. T.*

Annealing Cold-Worked Steels

THE operation of annealing as applied to cold-worked steels particular attention was paid to the structural changes taking place, including annealing below the critical range and the important factor of recrystallization. It will be unnecessary to do more than summarize this briefly. Annealing as applied to cold-worked steel has two objects: the first is to relieve internal strains and the second to effect complete recrystallization. For most wire one operation accomplishes both. The annealing operation is sometimes carried out below the lower critical point, Ac_1, sometimes just at the point, and occasionally above it, depending upon the composition of the material and the physical properties desired.

One of the noticeable effects of cold working is that the grains become more-or-less severely distorted in the direction of work. Pure iron ((ferrite) has a definite tem-

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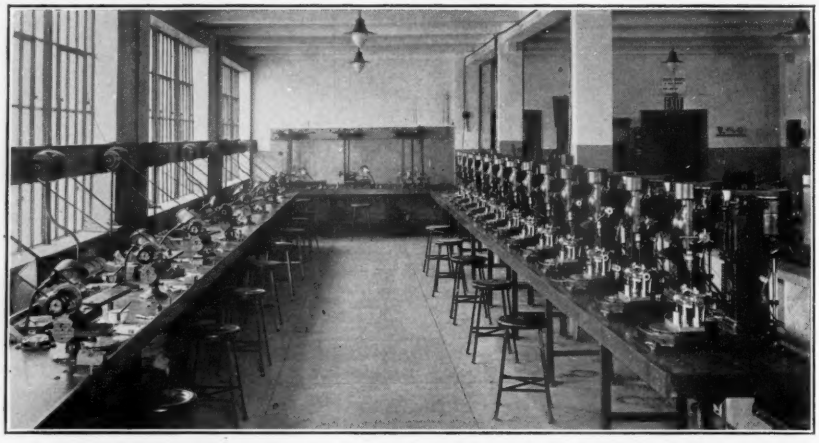

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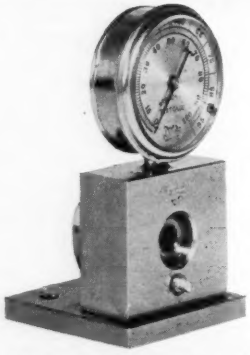

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perature above which recrystallization takes place. This temperature is, as we have seen, about 965 deg. Fahr. (520 deg. Cent.). Consequently if a cold-drawn wire of pure iron or low carbon steel is heated to 965 deg. Fahr. or above, recrystallization will take place; the elongated, distorted grains will be replaced by equiaxed grains. In the case of steels containing an appreciable amount of pearlite, heating to this temperature serves to recrystallize the ferrite grains but the elongated particles of pearlite remain unaffected.

Another well known effect of annealing after cold work is the spheroidization of the cementite which occurs at 1200 to 1290 deg. Fahr. (650 to 700 deg. Cent.) or just below the lower critical point, Ac_1. If a hot-rolled and annealed medium or high carbon steel is heated to this temperature spheroidization of the cementite takes place slowly if at all; but if this steel is cold-worked and then heated to 1250 to 1290 deg. Fahr., the spheroidization proceeds with great rapidity. The change in structure that takes place due to the divorce of the pearlite was illustrated in photographs of a hard drawn streamline wire reheated to 1100 and 1200 deg. Fahr., which show the practically complete spheroidization which occurred in this wire after heating for 1 hour.

Process annealing to soften cold-worked low carbon steel sufficiently so that it can be drawn to smaller sizes is usually accomplished by heating to a temperature varying from 900 to 1200 deg. Fahr. or below the critical range. Annealing the finished wire to remove strains, reduce the strength and increase the ductility is usually carried on at the same temperature. A few examples given in the following table will illustrate this.

The descriptive words, blue, black and bright, refer to the appearance of the wire after it comes out of the annealing pots. Needless to say in annealing bright wire special precautions are taken so that no scale will form on the wire during the heating, soaking or cooling.

Medium and high carbon steel wire if annealed at all, is process annealed by heating to the spheroidization temperature (1100 to 1290 deg. Fahr.). The complete formation of spheroidized cementite, which occurs rapidly after the wire has been cold drawn results in maximum softness and the most ductile condition for further cold work.

In general it is more difficult to anneal hard-rolled steel sheet and strip than wire, but these difficulties lie chiefly in the necessity for preventing the formation of scale and keeping the sheets from sticking to each other. The temperatures used vary from 1200 to 1400 deg. Fahr.

The Patenting of Wire

AMONG the heat treatment operations carried on to improve the properties of cold drawn wire is the unique process of patenting. Briefly, this consists of heating the hot-rolled rods* of medium or high carbon steel to a temperature several hundred degrees above the lower critical point, followed by slightly accelerated cooling. The object of patenting or sorbitizing, as it is sometimes called, is to produce a characteristic structure in the rod consisting of very large grains of fine granular pearlite or sorbite. This is produced by the combination of overheating and accelerated cooling.

The operation of patenting consists of passing the wire continuously through a long furnace. The cold wire enters at one end and is gradually heated until when it emerges from the other end it is at the desired temperature. This is one of the few operations in steel making that has been developed to a high state of perfection independent of metallurgical control. The difficulties involved in patenting become readily apparent when it is realized that the grain size of the properly patented wire must be large but not too large; the size depending up how much working the wire receives and what properties are required; and in addition the structure of each grain must be a fine granular pearlite or sorbite containing little or no laminated pearlite, free ferrite or troostite. When it is remembered that patenting is a continuous process the difficulties involved in producing this structure become plain. It is obvious that the rate at which the wire travels must be carefully regulated for rods of different sizes and the temperature must be changed if necessary for steels of different analysis. The length of time that the moving wire is maintained at the desired temperature must be closely controlled or grain growth will proceed too far. When these variables are all considered, the perfection of results obtained in modern wire mills is astounding.

It has been repeatedly emphasized in this as it is emphasized in all text books for that matter, that in heat treatment great care should be exercised not to overheat the material because grain growth of the austenite would take place.

(*Please turn to page 115*)

Pot Annealing Practice for Common Wire

Size Wire	Designation	Temp. Degrees Fahr.
About 0.090 in.	Rapid Annealing	1150-1200
Large Sizes	Rapid Annealing	1050-1100
0.035 in.	Common Annealing	900- 950
0.070 in.	Common Annealing	1100-1150
.....	Blue Annealing	750- 800
Bale Ties	Blue Annealing	1100-1150
0.016 to 0.062	Black Annealing	900-1000
Fine Wire (very small sizes)	Bright Annealing	750- 800
0.040 to 0.070	Bright Annealing	1150-1200

PHYSICAL PROPERTIES OF PATENTED AND COLD DRAWN WIRE (Adam)

Per Cent Reduction Per Pass	Diameter Inches	Ultimate Strength Pounds Per Sq. In.	Air-Cooled Torsions in 100 Diam.	Bends	Per Cent Reduction Per Pass	Diameter Inches	Lead-Cooled Ultimate Strength Pounds Per Sq. In.	Torsions in 100 Diam.	Bends
none	0.160	110,000	..	..	none	0.160	116,500	..	..
24	0.139	130,000	35	6	23	0.140	130,000	25	6
24	0.121	143,400	31	7	25	0.121	145,600	28	8
30	0.101	156,800	37	7	20	0.108	150,000	32	10
26	0.087	172,500	38	11	22	0.095	163,500	33	12
30	0.073	183,700	39	16	31	0.079	179,200	38	15
30	0.061	197,100	38	19	40	0.061	199,400	40	24
35	0.049	224,000	38	18	40	0.047	235,000	38	28
33	0.040	244,200	35	18	35	0.038	275,500	36	34
46	0.030	302,400	31	17	38	0.030	315,800	34	34

The Development of Wire Rope, III

by Percy R. Clark*

Point Versus Line Contact--Pre-forming Methods and Results--Roumanian Petroleum Industry's Pump Ropes ▼ ▼ ▼ ▼ ▼

(*Continued from page 36*)

THE author then passed the question as to whether point contact or line contact between the wires of a strand is to have preference in the future, and gave an explanation of the difference between these two types of constructions.

The length of the lay of a wire is the distance along the strand taken by the wire to make a complete circle. There is evidently a ratio between the diameter of the spiral and length of the lay, in other words, the greater the diameter of the spiral the longer the lay will need to be. If the outer lay of strand of 12 wires has a diameter of, say, 10 mm and a lay of 120 mm in the case of the 7 interior wires, which will have a diameter of 6 mm, the lay will be 72 mm, that is if each layer of wires is to bear its proportional share of the load. For many years wire rope manufacturers maintained approximately this principle, and this is called the principle of point, contact, inasmuch as the two layers of wire only touch each other at certain points.

With line contact construction the mathematical ratio of the lays is ignored—the outer and inner layers have the same length of lay.

In one respect this construction gives a big advantage. The length of the lay for different layers of wire being the same, the outer and inner wires are in contact with each other along their whole length and therefore the effect of lateral pressure (i. e. rushing and mashing) is distributed over the whole length of the wires instead of at the points where the outer wires cross the inner. Now dies crushing overcome the disadvantage of reduced tensile strength arising from disproportiona length of lay in the two layers of wire? This is an interesting point in which the wire rope user can assist the wire rope manufacturer.

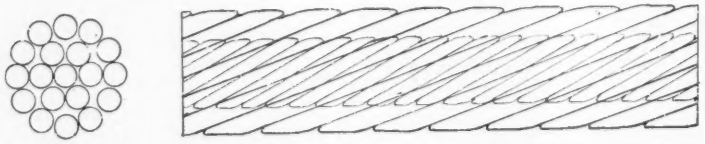


Fig. 52

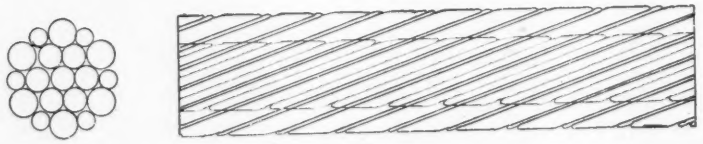


Fig. 53

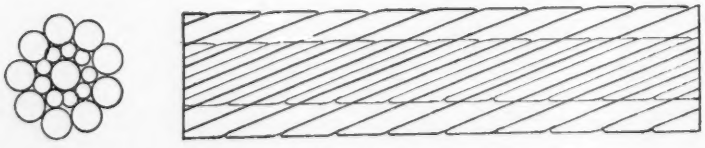


Fig. 54

There are two main classes of line contact ropes.

One is the Warrington, which is largely used in the petroleum industry in the States, both for drilling ropes and bailing lines.

In this rope we have two thicknesses of wire in the outside layer but in the orthodox manner, twice the number in the outside layer as compared with the inner layer. The outer layer is made up of thick wires and thin wires alternately. The thick wires lie in the grooves between the inner wires, thus giving a smoother surface to the strand.

The other rope is the Seale construction which is favored very considerably for haulage purposes in the forestry industry in the States.

In this rope is combined a maximum flexibility with a maximum of resistance to abrasion. There are a number of thick wires in the outer layer (generally 9) and a similar number of finer wires in the inner layer, so that each outer wire lies in a groove between the two inner wires, while the centre wire, which has to be a diameter larger even than that of the outside wires, is invariably of iron, to give as much flexibility as possible.

Another recent development of rope construction has been the filler construction. In the ordinary round wire ropes there are certain

*Societatea Anonima Anglia, Ploesti, Roumania. Abstract of paper read before Roumanian Branch, Inst. of Petroleum Technologist.

spaces left between the wires. Largely to combat the crushing of the lower layers of ropes on the drums, which obtains in drilling and certain other operations, fine wires (aptly called filler wires) have been introduced in the interstices between the ordinary wires of the strand. It is quite possible that an early development will be the application of line contact to this type of rope, which should give a very solid strand.

Preforming Ropes ▼ ▼ ▼

ONE of the most striking developments in wire rope manufacture has been the introduction of so-called preforming.

The original rope making machine, as patented by Mr. Newall in 1840, remained in use for a good number of years without conspicuous change. By this system the strand made up of wires or the rope made up of strands is drawn by sheer brute force through a die tightly screwed down and by that means the wires are forced into place in the strands and in like manner the strands into the rope.

A Professor Kovalski (Russian) devoted a good deal of time to the theoretical study of the wire rope, and he, by a mathematical formula, which he did not disclose, calculated that in order to kill the wire (i.e. to leave it without any recoil) the pressure on the dies would have to be over .9 of the breaking strain of the strand or rope. If this were to be put into practice the outer wires would be practically deformed by this procedure.

Steel wire of the higher qualities, which is the strongest and most flexible form of steel is brought to its exceptional condition by a series of drawings in the cold state through dies, but in doing so the wire is only drawn down about 10-15% of its sectional area at each pass and then owing to the structural deformation that has taken place is patented (passed through patenting furnace) by means of which the structure of the wire is returned to its normal state. In this manner before one reaches the final diameter and tensile strength required the wire may have 10-12 reductions. Now from this it is obvious that the wire rope making process as above indicated must deform the outer wires of the rope and there is no subsequent patenting to adjust matters.

The first movement towards the production of strands less subject to recoil was by the introduction of the flattened strand rope in 1888 by Latch & Batchelor, who patented the rope but not the machine for making same and were in fact able to keep the latter secret for many years.

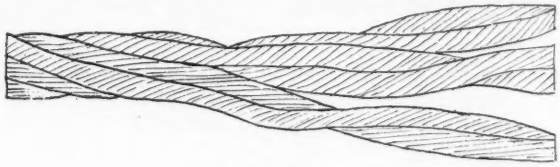


Fig. 55

In the year 1898 a certain Hardingham obtained a patent for the twisting of strands together and untwisting them before reaching or at the die, but so that the spiral originally formed in them remained. Here, of course, was the idea of preformation.

After that there came the system of drawing the individual wires through spiral dies before they reached the main die where they are placed together. This was a more practical step forward. Now, however, the ropes are being preformed under a system in which the wire and strands are rolled instead of being drawn before entering the die, i.e. the wires and strands are passed between suitably placed rollers which give the neccessary spiral form, and they are thus simply placed together in their correct positions in the die of the machine. In this manner we have a rope which is not deformed in the die, a rope in which the wires and strands are left with fewer conflicting interior stresses and by this means the use of the Lang's lay rope becomes easier.

To recapitulate, the advantage of preformed rope is that deleterious counter stresses are eliminated from the rope—the wires and strands lie dead. Hence:

1. Splicing becomes easier.
2. Broken wires do not protrude, and
3. There is less liability to kink.

Roumanian Petroleum Industry

At the conclusion the author spoke a few words in regard to the development of wire rope application on the Roumanian Petroleum Industry. He remarked that since he read his last paper to the Institute 2 years back, there had been very marked changes in the petroleum industry.

First, rotary drilling had almost superseded percussion drilling, and

Secondly, the compressor and the pump had been competing with the bailer and the swab for the extraction of oil.

The most marked favor in the petroleum industry recently has been the increased depths to which wells have been sunk. This has brought about serious changes in the requirements exacted from the wire rope.

First, the enormously increased tensile strain has caused severe lateral stresses on the lower layers of the ropes adjacent to the drum, giving rise to crushing, or mashing, of the rope.

Secondly, producers have been using for wells of depths as great as 1,800 meters, drilling ropes of a breaking strain which were specified for wells of, say, 1,000 meters. This has meant at times that the rope has been over strained.

It is not difficult to calculate the static stress on the ropes. For instance a well 1,800 meters deep, being drilled with 6 in. piping, taking the weight of the drill stem at 47.3 kgs. to the meter we have, together with tools, travelling blocks, etc. a load somewhere between 90 and 100 tons. Reckoning 10 falls of rope, which is probably the maximum used, we have a total static load on the rope of

(*Please turn to page 109*)

A New Market For Wire

The Inner-Spring Mattress Has Made the Bedding Industry an Important Consumer. Consuming More than 30,000 Tons Yearly ▼▼▼▼▼▼

THE bedding industry presents a rapidly growing market for wire. A considerable amount has always been used in the manufacture of bed springs. Now the growing popularity of the inner spring mattresses has vastly increased the demand from this source.

The inner spring mattress is a product whose history mingles romance, humor and pathos in a fiction-like manner. The pathos in the story is found in a press despatch which came to this country from Germany some 6 months ago. It indicated that Heinrich Westphal, to whom the invention of the inner spring mattress is attributed, is living in poverty. Westphal, now an octogenarian, is said to have conceived the idea of a spring mattress while recuperating on a hard hospital bed from wounds received in the Franco-Prussian War. He patented his idea in 1871 and presented his first mattress to Prince Bismarck. Circumstances prevented capitalizing upon his invention, and subsequently, since the expiration of his patent, others have reaped profit from the invention, while the aged German is now dependent upon the charity of his friends.

The humor and romance in the matter are supplied by a J. R. Nolon, president of the Marshall Patent Mattress Co., Ltd., London. Mr. Nolon entered the mattress business only, the story goes, when he "got mad" because no one else would do it. But the humor in this fact is over-shadowed by the romance in the fight he made to succeed in what no one else would undertake.

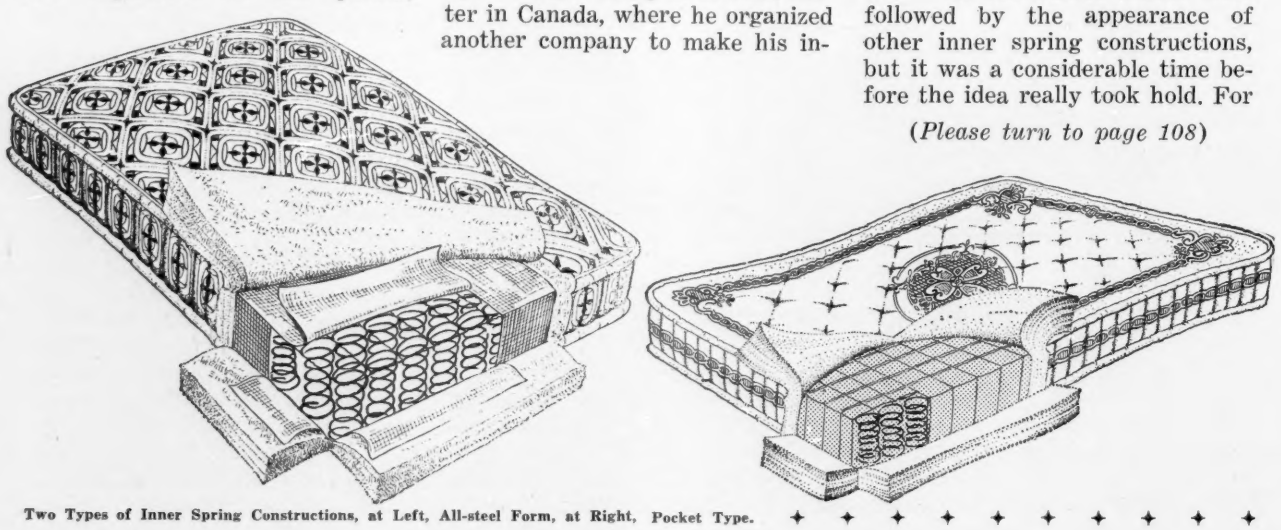
Marshall, the inventor of the first inner spring construction to achieve any real distribution, first started to make his mattresses in Chicago, 30 years ago. His success was only moderate, although the original organization continued to exist until only a few years ago. He got along somewhat better in Canada, where he organized another company to make his inner spring mattresses. Following his success there, he planned to introduce his product in England.

It is here that the above mentioned Mr. Nolon came into the picture. He was then engaged in a business not even remotely connected with mattresses, but the new idea interested him, so he set out to sell the idea to some British bedding manufacturer. But he found none who shared his enthusiasm. Finally he decided to try it himself. He had learned considerable about the industry while attempting to sell the idea to some one else, and was firmly convinced of the merits of the new product. His confidence was justified only after a hard struggle. But his justification is in the form of one of the largest and most successful bedding factories in England today.

Demand For Inner Springs Increasing ▼ ▼ ▼

MARSHALL'S early attempts in the United States were followed by the appearance of other inner spring constructions, but it was a considerable time before the idea really took hold. For

(*Please turn to page 108*)



Two Types of Inner Spring Constructions, at Left, All-steel Form, at Right, Pocket Type. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

Thyratron Tubes Maintain Tension as Wire Is Reeled

New Tube Finds Practical Use in Wire-drawing, Applicable Also to Magnet Wire Spooling and Similar Work ▼ ▼ ▼ ▼ ▼

THE versatile Thyratron tubes recently applied to the control of theater light dimming, has now found another application in the shops of the General Electric Co. at Schenectady. Wire produced in the wire-drawing shops must be kept at proper tension as it is reeled, and this tension is maintained by the use of Thyratron equipment.

The wire passes from a large reel through the wire-drawing equipment, where it is drawn down to the desired size, thence to a small spool where it is re-reeled. As the wire is drawn at a constant rate, the speed of the re-reel spool must be constantly decreased as the effective diameter of the surface on which the wire is wound increases.

The re-reel spool is driven by a small direct-current motor, power being supplied to the motor armature by Thyratron tubes. A small reactor controls the power supply by the tubes. This control is determined by the position of the core in the reactor, and the position of the core is governed by the re-reeling operation itself. The wire runs over a rider pulley mechanically connected to the reactor core. As the loop on which the rider pulley rides decreases when the re-reel motor is running too fast, the core is drawn into the reactor, increasing its reactance and causing the tubes to pass less current and so slow down the motor. Conversely, if the loop increases in length the reactor core is withdrawn causing the tubes to pass more current and so increase the motor speed.

Very little work is done by the rider pulley. The reactor core weighs but a few ounces, while the current controlled by the tubes can be sufficient to control the speed of a motor of several horsepower. In the present installation the tubes control the armature current to a ¾-h.p. motor, with the field excited from a separate source of direct current, but a similar control unit could be used to control a motor many times as large by supplying and regulating the field current instead.

Provision is made so that a failure of either the alternating or direct current, or breaking of the wire, causes a shut-down not only of the re-wind motor but also of the main motor driving the wire-drawing machine.

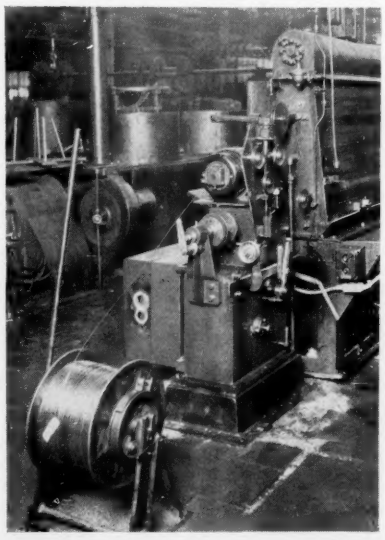


Fig. 1. Thyratron Control for Wire-drawing Winder. ✦ ✦ ✦ ✦ ✦ ✦

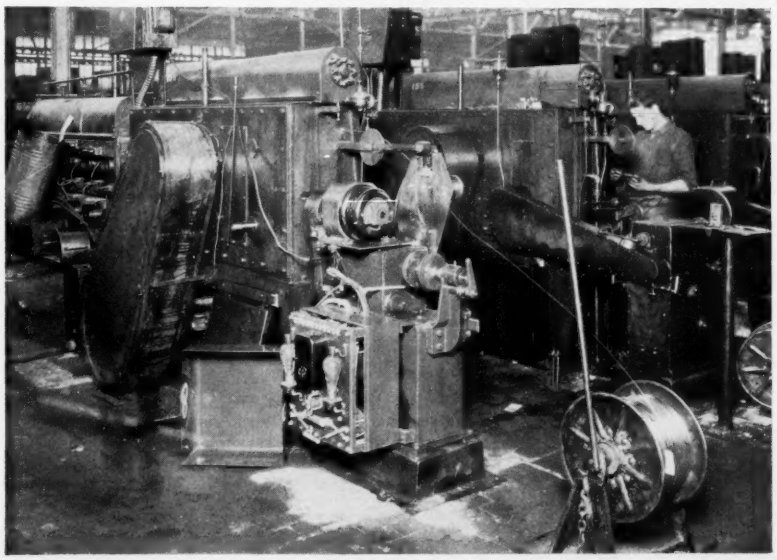
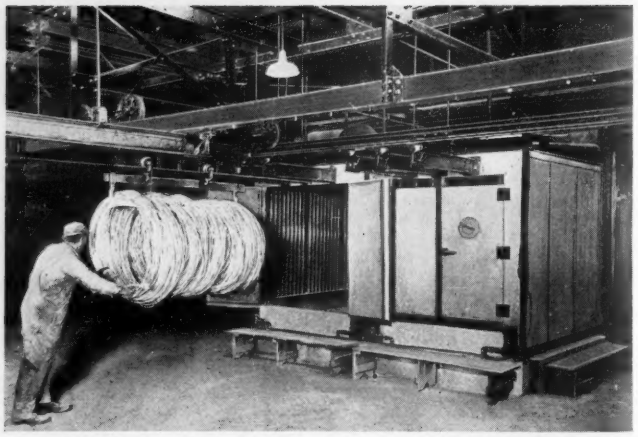


Fig. 2. Front View Showing the Thyratron Tube with Cover Removed. ✦ ✦ ✦ ✦

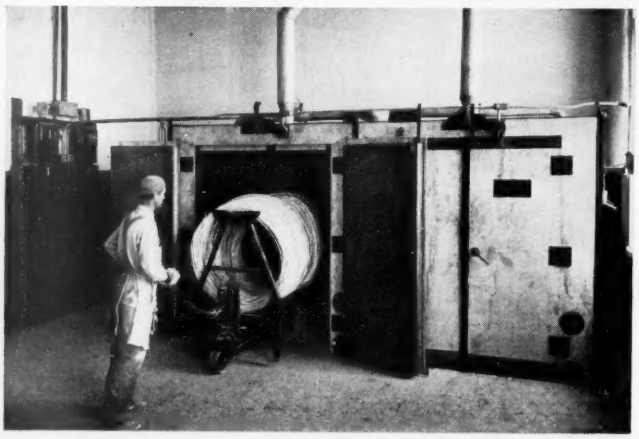
Many Oven Uses In

By Philip Kriegel

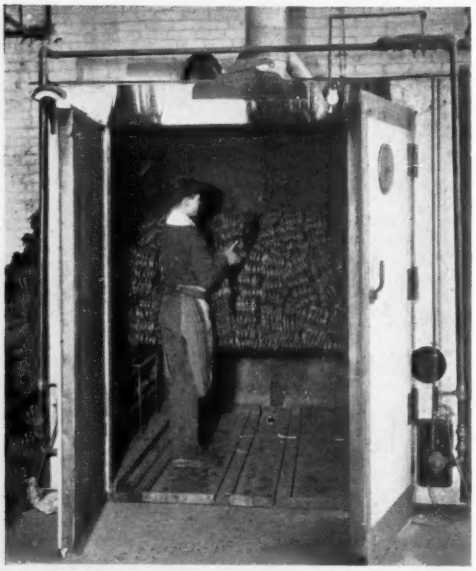
THERE was manufactured in the U. S. in 1929, a total value of wire and wire products amounting to $884,460,174. Ovens play a very important part, whether in the drawing of wire for direct use or its fabrication into articles for home, industrial or commercial use. General products, as springs, enameled or insulated wire and cable (a great deal of which is used for armature and electrical windings, screen-

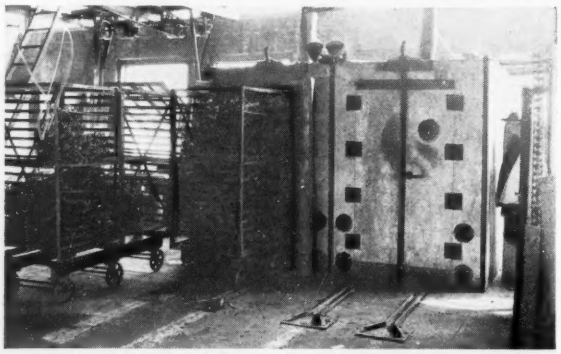


IMPORTANT in the wire-drawing mill is the baking of coils of wire or rods previously dipped in a lime solution. Complete and uniform drying of the wet lime in the shortest time and absolute elimination of "acid brittleness" are important. This new type insulated steel-panel oven, eliminating the polluting of oven atmosphere with products of combustion, has contributed largely toward reduction of baking time, speeding production, cutting down floor space. The picture above shows bundles of wire for airplane cables and other high-quality wire rope being loaded into gas-fired ovens through overhead track system.



TEMPERING at heats in the neighborhood of 600 deg. Fahr. is necessary to remove strain from springs. Here are two representative installations for this; hand loading of spiral springs used in mattress manufacture in a small direct gas-heated box-type oven (left), and tempering truck loads of springs in electrically-heated ovens (below).



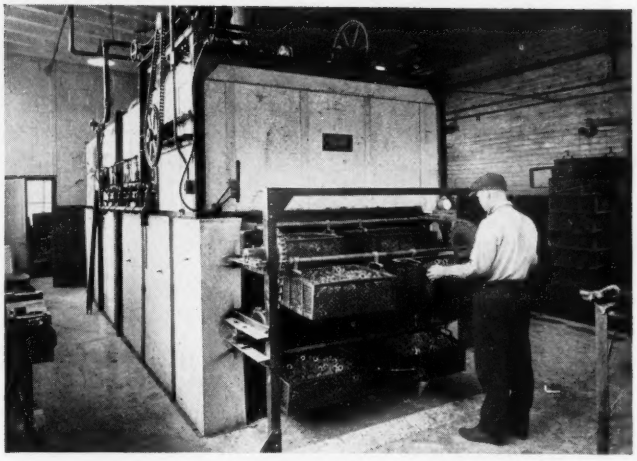


the Wire Industry

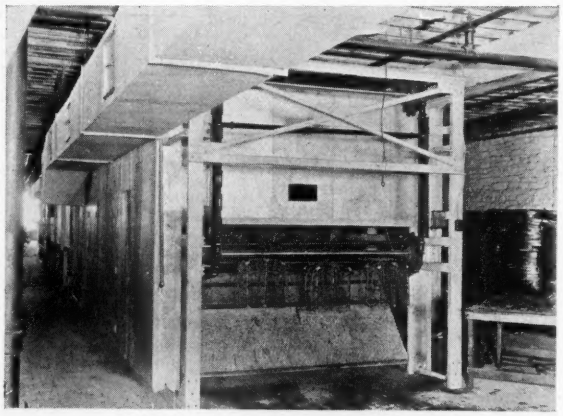
Photographs by Courtesy of Gehnrich Oven Company, Inc.

ings and other products), invariably are coated with enamel or varnish, baked in ovens, or in case of springs, tempered.

Proper selection and operation of such ovens is economically important. Careful design of this equipment to provide the most suitable heating medium, correctly applied, and the most efficient handling system consistent with operating needs and sound oven construction to embody proper insulation and ventilation, are vital in modern production.

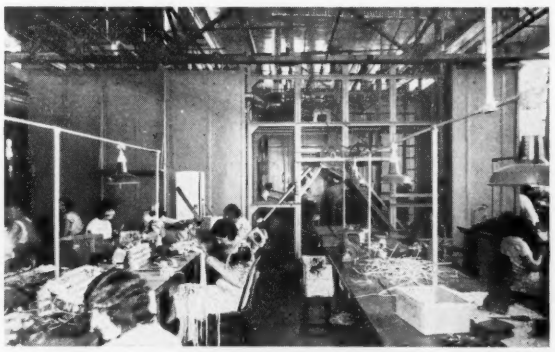


FINISHING operations on the great miscellany of coiled springs involve dipping in japan or enamel, and baking for a suitable time. In large scale production conveyors have proven economical. Above is a typical conveyor oven in which baskets of valve springs are hung on flights of a two-strand conveyor which takes them into an enamel tank, over a long drain section to permit removal of excess drippings. At rear, conveyor moves up into baking chamber for return pass for unloading at original point of handling. One operator handles the whole job. ✦ ✦ ✦ ✦ ✦



CUTTING down expense to lower sales price has been an important factor leading to use of modern machinery in the highly-competitive upholstery and mattress spring industry. The industrial oven has contributed its easy adaptability to complete automatic systems.

The continuous double-strand conveyor above is a typical large plant installation. It is 110 ft. long, for tempering and baking japan on a great variety of springs for upholstering railroad car and automobile seats and backs, couch bottoms, etc. Small coil springs in bundles, springs in sections and complete assemblies are hung on flights of conveyor which pass to a japan tank for dipping, over long drain section for removal of excess, through baking section, gradually cooling and removed at other end completely cold and dry. This oven bakes 10,000 lbs. of springs an hour at 500 deg. Fahr.



INSULATED wire, used in manufacture of electric motors or other electrical appliances with moving parts, is wound into coils, cambric covered, dipped in insulating varnish, baked. Here is a typical setting with workers winding cambric on silk-covered enameled copper wire. Two continuous ovens in background have dip and drain sections between. Taped coils are hung on flights of smaller oven at right, preheated, emerge to take a varnish coat in dip tank, drain and enter larger baker for a definite period, cooling on return pass over entire structure to be unloaded at original loading point. This practically-automatic operation in production of these coils for electric meters and clocks handles an enormous quantity.

Wire Questions and Answers

Question No. 7---Grinder for Die Reaming Tools ▼ ▼ ▼ ▼

The Wire Association:

We would like to know about a small machine for grinding the reaming and backing-out tools used in reaming cast iron wire-drawing dies.

Answer Number 1.

The Wire Association:

Our die makers grind these tools by hand holding them on a small grindstone using water lubrication. No special machine is used. They have become expert enough from long practice.

Answer Number 2.

The Wire Association:

The machine used for grinding and reaming tools used for reaming cast iron wire drawing dies is usually a common wet grindstone. Ordinarily each mill equips this with a suitable sliding holder to hold the tools at various angles for the grinding of the ordinary square section reamers and the two-lipped flat backing out tools commonly used.

Answer Number 3.

The Wire Association:

Small grinding machines in tool rooms are frequently supplied with special indexing fixtures for grinding a uniform taper on these square and half round tools. These have always been standard fixtures or local design, but there have been special machines offered on the market for the grinding of punches for hand hammered and punched steel dies.

Answer Number 4.

The Wire Association:

We do not know if there is any such machine made to improve these tools or not. Our tools are made by a tool maker—in other words it is blacksmith work.

Question No. 8---Slivers in Wire Rods ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼

The Wire Association:

To what do you attribute slivers in wire rods?

Answer Number 1.

The Wire Association:

Seams in wire rods are caused by not enough metal being cut off, the segregrated ingot when this is rolled into a bloom. In particular work a specified number of blooms of certain size and weight are allowed to be used by each ingot thereby leaving a safe margin to be cut off.

In alloy steel the frequency of this condition is due to a desire for increased production. In turn this has an influence in charging the furnace when making heat only Pig-Iron is used to give the required carbon point. If a few hundred more pounds of Pig-Iron were put into the charge, it would require further boiling down after melting, thereby purifying the metal, closing the grain and eliminating gases which are the causes of segregation.

The Wire Association is for the specific purpose of improving production methods. It was organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The following inquiries were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms or individuals sending in the inquiry, or of the men or firms replying are divulged without permission.

Join the Wire Association!

Question No. 9 ▼ ▼ ▼ ▼ ▼ ▼ ▼

The Wire Association:

Why does lime deteriorate when used with dies?

Answer Number 1.

The Wire Association:

The lime bath used in a wire mill has to be dumped and replaced at intervals because it ceases to be a good lubricant. This is presumably due to the gradual building up of calcium sulphate due to a slight carry-over of sulphuric acid. Calcium sulphate is not very soluble and its crystals are likely to be abrasive. The amount of rods that can be coated before the job is cleaned out is unknown. Some mills wait until they get into trouble before they dump. Others dump at stated intervals whether necessary or not. I never knew anyone to determine definitely what made it necessary to dump the lime and if it is calcium sulphate how much the concentration can be before dumping is advisable. Has any member ever studied the matter and is he willing to speak up?

Answer Number 2.

The Wire Association:

It is true that these lime tanks must be changed at certain intervals but not exactly for the reason set forth in your question, namely the presence of calcium sulphate as far as the direct action of that product is concerned.

In general, the contents of the lime tanks in which the wire is dipped are changed at intervals which are largely dependent on the tonnage of wire produced, and the interval varies from thirty days to six months. The practice in some western mills with production running as high as two hundred tons per day, is to change and clean their lime tanks once a month. Some eastern mills, with a low production as far as weight is concerned, will effect this change and cleaning of the tanks possibly once every six months. Another factor as regards the question of time of changing may depend also upon the superintendent, who, in one case may change more frequently than another superintendent, although both may be making the same grade of wire.

The real reason for changing the lime bath and cleaning the tanks is due to the gradual increasing contamination of the lime with acid carried over from the pickling vats. Indications that the lime bath is becoming contaminated are evidenced in the presence of rust on the wire which may take place between the time the rods are removed from the lime bath and before they are placed in the baking oven. Another indication is that the wire, due to the presence of the rust, will "Squal" as the wire passes through the dies or plates.

No exact determination has been made as to the concentration, before dumping is advisable, but the physical danger signal above cited is sufficient indication that it is time to change the contents of the tanks. Also it is not possible to state definitely the amount of rods that can be coated before the tanks are cleaned, because as stated above, this amount depends solely on the production of the plant in question. For instance, we can say that a mill producing two hundred tons per day and changing their lime bath every thirty days can get approximately 5000 tons from a tank before changing, while a mill producing 100 tons daily and changing every two months can get the same quantity through before changing.

Reaction to Above Answer ▼

The Wire Association:—

It is perfectly true that the wire may rust between the lime bath and the baker but I believe this is a function of time rather than the composition of lime bath. Wire will sometimes squal as it passes through the die but this may be for any of half a dozen reasons. If the lime tub were dumped and cleaned out every time the wire squealed or rust was formed, it would be a wonderful thing for the lime companies, but expensive for wire drawers.

This writer says that the real reason for changing the bath is the gradual increasing contamination of the lime with acid. This is exactly what I say except that I call it calcium sulphate which would be the logical result of the introduction of sulphuric acid into a bath of lime. I hope he is not implying that free sulphuric acid could exist in an alkaline solution but this is what his reply seems to indicate.

We are no further along with this matter than we were before. I wish someone connected with one of the large wire companies would make a reply.

Question No. 10--Dies for Making Galvanized Clothes Line

The Wire Association:

What types of closing dies are used in making galvanized clothes line and of what material are these dies composed? What kind of a core needle is used and is this lubricated or used without lubrication?

Answer Number 1.

The Wire Association:

The closing dies on these machines are made of steel, hardened. We are not in a position to advise on the kind of core needle required nor as to the necessity of lubricating this needle at the closing die.

Answer Number 2.

The Wire Association:

In stranding galvanized wire it is not believed that the die is lubricated although no serious reason can be thought of why this should not be done. In the majority of plants the dies are made of charcoal iron, i.e. a fine, close-grain cast iron having a maximum of free carbon which is understood to act as a lubricant. This material acquires a very high polish and a resultingly glass hard surface. Others use Jessop tool steel, some a high speed steel as used in machine shops, and still others use a very hard bronze, specifically "cramp's" gear bronze.

While we have no recollection of examination of a core needle for hollow cable, we believe this should be made of a fine grade of high speed tool steel.

Answer Number 3.

The Wire Association:

The closing dies are made similar to those used on rope machinery and are generally of high carbon tool steel. The needle is generally made of the same material but long enough to allow for float at the closing die and is supported at the rear end only. The end which enters the closing die follows the same contour as the die except for an allowance or clearance for the wires.

No lubricant is allowed at the closing die as this would soil the clothes.

Many manufacturers make a clothes line with a thin flat ribbon of steel in the center. This is known as the Stone Patent. We do not know whether this patent has expired.

Question No. 11--Wiping Galvanized Wire Netting

The Wire Association:

We, at times, experience some difficulty with our galvanizing of square and hex mesh netting. We use a coke wipe about 6 in. deep moistened by water spray. Our wire surface is rough. Perhaps some one in the Wire Association would be willing to advise if coke is the best wipe and if not give their opinions. I should like to know if there is a better method of wiping netting.

Answer Number 1.

The Wire Association:

I am under the impression that smoother work can be done by keeping the coke saturated with oil. I noticed in Belgium, one manufacturer doing what was apparently a very good job with granulated blast furnace slag.

Answer Number 2.

The Wire Association:

Regarding your question on galvanizing netting, I have tried all wipes on this work, coal coke, sand, carbon, etc., but find charcoal to be the thing. I use two grades, 3 and 10 and mix 50-50 of each. One is coarse and one is fine. Use this wipe and it will be found that water will not even be needed to any extent. To get all work very smooth on a close mesh product I advise putting a little melted tallow on the wipe occasionally. Get pure tallow and melt down with some thin oil about 50-50 and put a small amount on the wipe every hour.

NEW QUESTIONS

Question No. 18--

The Wire Association:

What causes the wire to rust after it has been cleaned and lime coated and how can it be prevented?

Question No. 19--

The Wire Association:

In tempering wire (air-temper) which is the most economical, high speed and direct flame or low speed and protected surface?

Question No. 20--

The Wire Association:

What is the maximum per cent of reduction in order to maintain quality when drawing high-carbon steel?

Question No. 1--Wire Gauges

Additional reference to the subject of wire gages as this was first published on pages 16, 17, etc., of the January issue.

The Wire Association:

There is not one wire gage in use today either in England or America that a uniform reduction from size to size in proportion to the diameter of the wire, enclosed is a list of various gages in use and not one has a uniform reduction. Allow me to refer to one case. Washburn and Moen wire gage from Number 5 (.2070) to Number 6 (.1720) equals 15/1000

(*Please turn to page 112*)

Table of Wire Gages, With Differences Between Sizes—Rawson

Wire Gauge	Washburn & Moen or American S. & W. Co., Gauge. Decimals	Decimals reduced from size to size —thousandths	Brown & Sharp Gauge	Decimals reduced from size to size —thousandths	Wm. Crabb & Co., Gauge	Decimals reduced from size to size —thousandths	English Standard or Imperial Gauge	Decimals reduced from size to size —thousandths	Rawson Revised List Submitted	Decimals reduced from size to size —thousandths
0.	.3065		.32486				.324		.324	
1.	.2830	23	.2893	34	.284		.300	24	.300	24
2.	.2625	21	.25763	32	.270	14	.276	24	.277	23
3.	.2437	19	.22942	28	.2405	29½	.252	24	.255	22
4.	.2253	18	.20431	25	.229	11½	.232	20	.234	21
5.	.2070	18	.18194	23	.209	20	.212	20	.214	20
6.	.1920	15	.16202	20	.1935	16½	.192	20	.195	19
7.	.1770	15	.14428	18	.176	17½	.176	16	.177	18
8.	.1620	15	.12849	16	.163	13	.160	16	.160	17
9.	.1483	14	.11443	14	.1465	16½	.144	16	.144	16
10.	.1350	13	.10189	13	.1305	16	.128	16	.129	15
11.	.1205	15	.090742	11	.115	15½	.116	12	.115	14
12.	.1055	15	.080808	10	.1025	13½	.104	12	.102	13
13.	.0915	14	.071961	8	.088	14½	.092	12	.090	12
14.	.0800	11	.064084	8	.0785	9½	.080	12	.079	11
15.	.0720	8	.057068	7	.069	9½	.072	8	.069	10
16.	.0625	9½	.05082	7	.060	9½	.064	8	.061	9
17.	.0540	8½	.045257	5	.05375	6½	.056	8	.053	8
18.	.0475	7½	.04003	5	.048	6½	.048	8	.046	7
19.	.0410	6½	.03589	5	.0415	6¾	.040	8	.040	6
20.	.0348	6	.031961	4	.03775	3¾	.036	4	.035	5
21.	.0317	3	.028462	3½	.0355	2¾	.032	4	.031	4
22.	.0286	3	.025347	3	.03075	4¾	.028	4	.028	3
23.	.0258	3	.022571	3	.028	2¾	.024	4	.026	2
24.	.0230	2¾	.0201	2¼	.0255	2½	.022	2	.024	2
25.	.0204	2½	.0179	2	.022	3½	.020	2	.022¼	1¾
26.	.0181	2¼	.0159	2	.020	2	.018	2	.020¾	1½

'Round the World With the Wire Industry

Rapid Progress in Wire Show Plans

PLANS for the second annual wire show to be held at The Auditorium, Cleveland, O., June 15-19, are progressing rapidly. In the matter of entertainment and interest for executives and technical men, a fine program is being worked up, and many exceptional addresses have been scheduled by men prominent in the industry. Also as a matter of distinct trade interest, substantial support has been given to the enterprize by many of the largest firms who will present operating exhibits.

As now planned, there will be several technical sessions, spread over two or three days, as compared with the single session at Buffalo last year. Papers to be presented and discussed will include: Galvanizing Processes and Methods, Insulated Wire and Cable Production Methods, Lubricants and Die Lubricating Methods, Annealing Methods in Bright Wire Production, Gages—Proposals to Standardize Wire Gages, the latter largely if not wholly discussion.

Members of the Wire Association and others planning to attend are requested to prepare to present points of their own, or special phases of these subjects which they are prepared to discuss, or questions which they desire to ask the speakers.

Interspersed in the program of papers and discussions will be moving pictures rather evenly divided between steel wire and nonferrous wire subjects. Those now arranged for include: The Story of Steel, The Story of Steel Wire Products, The Manufacture of Wire Rope, The Fabrication of Copper, and The Production of Insulated Wire and Cable. In each case, a speaker or lecturer will accompany the film and point out special matters of interest to wire men.

As this is written, late in February, the following firms have contracted for space for exhibits at the Show, most of these being operating exhibits showing processes of production; The Morgan Construction Co. will show a continuous wire-drawing machine; Sleeper & Hartley Inc. will exhibit spring-making machinery and continuous wire-drawing machinery; The Micro Products Co. will exhibit a new type of rod-welding machine; The Hallden Machine Co. will show automatic straightening and cutting machinery; The Lewis Machine Co. will exhibit wire straightening and cutting machines; The Sefton Natl. Fibre Can Co. will show fibre spools for shipping wire; The Ludlum Steel Co. and the Master Wire Die Co. jointly will exhibit tungsten carbide metal and dies; The Union Wire Die Co. will show diamond dies and tungsten carbide dies in rod tube and wire sizes; The Carboloy Co. will exhibit rod wire and tube tungsten carbide dies; R. B. Hayward Co. will show reels.

Arrangements for visiting some of the more prominent mills and plants in Cleveland and vicinity are being made and will be published at an early date. Similarly, sightseeing and other trips may be arranged for the entertainment of visitors. All told it will be an exceptionally interesting week for wire men, and judging from present response, more than 500 wire men from all over the country will be present. Attendance at last year's meeting approximated 200.

Australia Proposes Manufacture of Cable

That the manufacture of insulated cables and wires would be undertaken in Australia, provided adequate protection was assured, was a statement made to the Tariff Board in Sydney recently. The interests concerned are seeking a duty on imports of the materials in question.

Harold Daniell, a director of the Dunlop-Perdriau Co., said he represented the combined interests of the Cable Makers' Assn., Metal Mfgrs., Ltd., and Dunlop-Perdriau, Ltd., the capital of which amounted to more than £23,000,000 ($115,000,000). For some time negotiations had been carried on, said Mr. Daniell, among the three interests with a view to the manufacture of this class of cable and wire in Australia, and with the imposition of a sufficient duty a company would be formed with a capital of £250,000 ($1,250,000), of which probably £100,000 to £150,000 ($500,000 to $750,000) would be expended in land, building, plant, and machinery before commencing operations.

When the factory was in full operation, employment would be found for 400 or 500 hands, with an annual wages bill of approximately £80,000 to £100,000 ($400,000 to $500,000), which did not include the labor engaged in the production of copper wire supplied by Metal Mfgrs., Ltd., from their existing plant at Fort Kembla. Rubber compound and sheet would be supplied and manufactured by Dunlop-Perdriau Co., in Australia. The annual requirements in the Australian trade in the sizes it was proposed to manufacture, Mr. Daniell estimated at between £400,000 and £500,000 ($2,000,000 and $2,500,000). From 9 to 12 months would elapse from the time plans were prepared before the plant would be in production, and a further 3-6 months before the full requirements of the trade would be satisfied. An expert from England would advise the company in regard to the factory, plans and other matters.

Spiral British Ship Cable

For a great many years, in fact since the first application of electricity to the lighting of ships, it has been the recognized practice to carry out ship wiring with vulcanized rubber insulated lead-covered cable. This was sufficiently satisfactory when electrical circuits were restricted to lighting incandescent lamps, and small lead-covered cables were employed. As

time went on, the employment of electricity was increased to cover circuits controlling larger and more important apparatus, and with changes of design, both of ships and equipment, the effect of vibration on the pure lead used became a very urgent problem.

This problem has been solved in several ways. One of these is to alloy the lead sheathing with tin or other suitable metals, with the result that it will withstand vibration satisfactorily. Another is to avoid the use of lead entirely by substituting for it a sheathing of some other material which is tough, flexible, and unaffected by conditions at sea.

One of the most successful cables made in Britain for the purpose is built on the last-mentioned lines. It is the product of recent experimental work at the Prescot plant of British Insulated Cables, Ltd. After exhaustive tests at the National Physical Laboratory, Teddington, this new "H R" type cable was approved by Lloyd's, and has been used with complete success in several important ship installations. The latest instance of its use is the White Star motor vessel Britannic, now approaching completion in Belfast. Approximately 100 miles of this cable, ranging in size from 3/.029 in. to 127/.103 in. sectional area have been used in this large vessel.

The dielectric of this special type of cable consists of a high-grade vulcanizing rubber specially designed to work satisfactorily in high ambient temperatures. Single cables are then sheathed with a special flexible waterproof material, taped, braided, and painted overall. In the use of multicore cables there is no jute worming between the cores, the latter being laid up with a soft rubber center where necessary, then wormed and sheathed with the special waterproof material already mentioned.

Recent Wire Exports Gain

Sales of American wire and wire manufactures to foreign consumers have made large gains in the last few years, but they are still less than before the war. This year they show a marked decline.

While not yet up to the 18,000 tons per month in 1913, the foreign sales of 11,800 tons monthly last year, and 11,600 tons in 1928 exceeds the 8,800 tons in 1927. The 1929 excess was nearly 34% over 1927. But to May 1st, this year, at 7,325 tons per month, they are about 38.6% under 1929.

The products included above are plain wire, barbed wire and woven wire fencing, wire cloth and screening, wire rope and wire nails.

COMING EVENTS

Mar. 9-13—American Institute of Electrical Engineers, District Meeting, Pittsburgh, Pa. F. L. Hutchinson, 33 W. 39th St., New York.

May 7-8—Iron & Steel Inst. (Great Britain) Annual meeting at Inst. Civil Engs. Gt. George St. London, S. W. 1. Sec'y 28 Victoria St., London, S. W. 1.

June 8-12—54th Convention and Exhibition, Nat'l. Elec. Lt. Assn., Atlantic City, N. J.

June 15-19—Second Annual Wire Assn. Show and Convention, simultaneously with Iron & Steel Exposition, Public Auditorium, Cleveland, O. Richard E. Brown, Sec'y. Wire Assn., 551 Fifth Ave., New York.

June 22-26—American Society for Testing Materials—Annual meeting, The Stevens Hotel, Chicago. C. L. Warwick, Engineers' Club Bldg., 1315 Spruce St., Philadelphia, Pa.

Sept. 1932—Joint Meeting, Iron & Steel Inst. (Great Britain) and Amer. Inst. Mining & Matt. Engs. Technical sessions in New York. Visits to Bethlehem, Pa., and Pittsburgh, Pa., Washington, Youngstown, Detroit, Cleveland, Chicago, Niagara Falls, Hamilton, Toronto, Montreal, also to Lake Superior mining region, via. Duluth.

Germans Cut Wages to Cut Steel Prices

In a decisive step to reduce drastically the cost of production and the cost of living in Germany, an association of leaders in the iron and steel industry cut their prices an average of 3c in June.

The government approved a reduction in the wages of workers of 7½%, to take effect 4 weeks after the reduction in iron and steel prices. This reduction affects approximately 200,000 workers.

Labor unions have acquiesced to try the experiment, hoping to start a general reduction in prices and to provide more work. However, workers in some quarters have demanded a larger cut in steel prices than 3c, arguing that this is not large enough to correspond with the reduction in wages.

In the meantime the German government is busy negotiating loans for public construction in order to take up some further slack of unemployment.

In this experiment, German business men are taking the opposite approach to the road to prosperity than has been employed in this country, where additional machinery making labor more productive has been mainly relied upon to lower production costs rather than wage cuts, which naturally result in less money for the people to spend.

As this was going into effect, with strikes and other signs of discontent, Henry Ford raised wages in his Berlin plant from 2.4 m. an hour to 2.5 m.

Foreign Trade Opportunities reported by Bureau of Foreign and Domestic Commerce during month of February include inquiries for wire or wire products for the following sources: Wire, wire supplies and fixtures (49654) Caracas, Venezuela; round iron bars for concrete and cement construction work (49698) Arica, Chile; bale ties and buckles (49808) La Paz, Bolivia; needles (49783) Habana, Cuba; wire staples (49826) Prague, Czechoslovakia; steel bars, strip, and wire, bright drawn and black finish sections and bars (49798) Birmingham, England; galvanized wire shorts (49803) Hong Kong; resistance wire (49952) Montreal, Canada; wire and cables (49994) Paris, France; clips and pins (49993) Santiago, Chile; pins and needles (49932) Montreal, Canada; barbed wire (49933) Rio de Janeiro, Brazil; copper rods (49933) Rio de Janeiro, Brazil; mattress springs and clips (49967) Johannesburg, South Africa; enameled copper wire (50141) Berlin, Germany; needles (50046) Lourenco Marques, Portuguese East Africa; hand and machine sewing needles and crochet hooks (50042) Milan, Italy; airplane steel wire (50058) Turin, Italy; barbed wire (50027) Pernambuco, Brazil; steel-rolling mill machinery (50121) Paris, France.

Outstanding Personalities of the Wire Industry

FRED J. CONNOR

FRED J. CONNOR has been connected with the steel industry for 22 years. For 20 years he has been connected with the Wickwire Spencer Steel Corp., and its various companies. Mr. Connor has served in the capacity of machinist, tool maker, machine shop foreman, master mechanic and has spent a number of years on engineering problems in connection with the wire industry. He was superintendent of the Morgan Works for four years and at present is manager of the Worcester District of this company.

Mr. Connor attended the grammar schools at Worcester, Mass., is a graduate of the Worcester Evening High Schools, studied mechanical engineering for four years in the evening schools, three years at accounting and is a member of the Massachusetts Bar, being a graduate of Northeastern University, and holds the degree of LLB.

Dr. Robert C. Williams has been appointed as a member of the technical staff of Battelle Memorial Institute, Columbus, O. Dr. Williams is a graduate of Oberlin, where he specialized in colloidal chemistry, and received his Master's degree for additional work in this field. He extended his work at Stanford, securing his Doctor's degree there. During the past 2 years Dr. Williams has been engaged in industrial research with a large rubber company. He joins the Institute staff to undertake a program of research sponsored by industry.

—

Robert Lee Wilson, assistant to the president of the Westinghouse Elec. & Mfg. Co. has resigned. Mr. Wilson rose from apprentice to draftsman, to inspector, road engineer, district engineer, superintendent of railway construction, assistant general superintendent, works manager, and assistant to the president. His progress during the 37 years of his connection with Westinghouse was constantly and steadily upward.

While superintendent of railway construction from 1906 to 1909, he handled the biggest jobs ever undertaken by Westinghouse, electrification of the New York, New Haven & Hartford railway and the St. Clair tunnel of the Grand Trunk railroad, the first two important alternating current railroad electrification projects in the United States. He will be retained by the Westinghouse Company on call in a consultative capacity.

—

Robert S. Hopkins has been appointed manager of the metropolitan New York district sales office of General Cable Corp., 420 Lexington avenue, New York. He succeeds the late Harry A. Hammond. Mr. Hopkins has had 25 years experience in the electrical wire and cable industry. Prior to October, 1930, he served as New York district manager of the Standard division, and prior to its merger with General Cable Corp. in 1927 he was in charge of sales engineering of the New York office of Standard Underground Cable Co.

—

Reuben E. Sommer, vice president in charge of sales of the Keystone Steel & Wire Co., Peoria, Ill., has been elected president, National Fence Mfrs' Inst. Mr. Sommer has been vice-president of the organization and chairman of an important committee during the past two years.

—

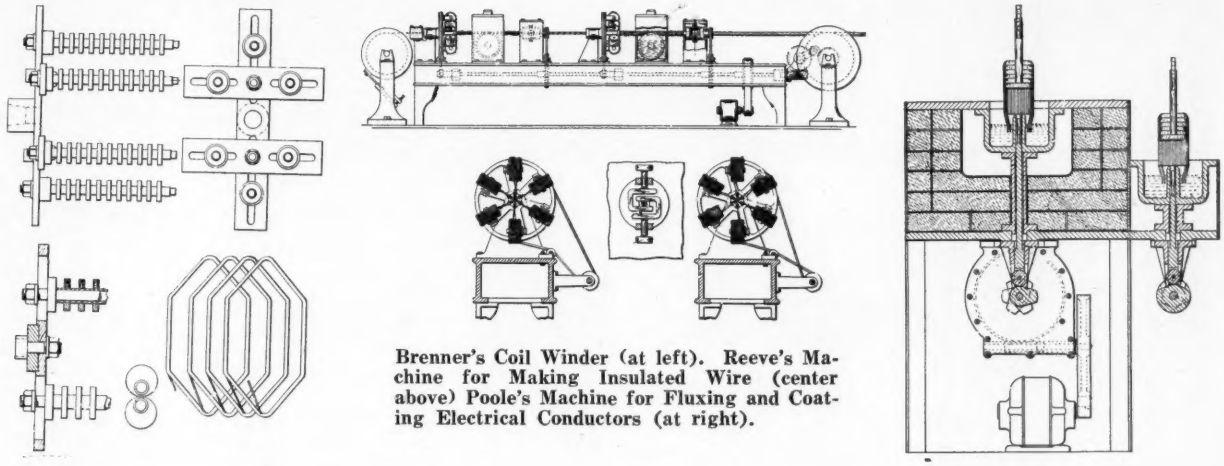
Harry W. King, head of the engineering department of The Morgan Eng. Co., has jointed The Aetna-Standard Eng. Co., Youngstown, O., as assistant vice president. Mr. King served many years as assistant to C. L. Taylor, formerly vice president of the Morgan company, and rejoins Mr. Taylor at Aetna-Standard in the same capacity.

TRADE NOTES

Eugene F. Phillips Elec. Works, Ltd., Montreal, Canadian manufacturers of round and flat copper rods, bare and insulated electric wires, lead-covered power and telephone cables and other wire products extending its wire and cable manufacturing activities by the addition of five new units at the Brockville, Ont., plant. This company is in the market for up-to-date copper wire drawing and stranding machines, together with new equipment for the winding, braiding and rubber covering departments, and it is considering also the replacement of its copper rod rolling mill with a mill of greater capacity.

The New England Butt Co. and the Reel & Spool Dept., of the American Pulley Co., both under the supervision of W. A. Richards, have moved to 20 No. Wacker Drive, Chicago, Ill.

A Review of Recent Patents



Brenner's Coil Winder (at left). Reeve's Machine for Making Insulated Wire (center above) Poole's Machine for Fluxing and Coating Electrical Conductors (at right).

No. 1,787,612, COIL WINDER, Patented Jan. 6, 1931, by Cameron C. Brenner, Rochelle, Ill., assignor of one-half to Herbert S. Bain, Rochelle, Ill. This coil winder is intended for the winding of coils for dynamo-electric machines, and the device may be mounted upon a head stock spindle of a lathe, the device having coil winding posts extending from the frame, parallel to one another and arranged to be adjusted toward or away from one another according to the size and shape of the coils to be wound.

No. 1,787,657, CUTTING MACHINE, Patented Jan. 6, 1931, by Karl H. Andren and Haakon T. Olsen, Milwalkee, Wisc., Assignors to Artos Engineering Co., of Milwalkee, Wisc., a Corporation of Wisconsin. Specifically, this invention covers a machine for automatically measuring, marking, scoring or severing material into pieces of predetermined length. Means are provided for severing material at any predetermined angle relative to its surface.

No. 1,787,658, CUTTING AND STRIPPING MACHINE, Patented Jan. 6, 1931, by Karl H. Andren and Haakon T. Olsen, Milwalkee, Wisc., Assignors to Artos Engineering Co., Milwaukee, Wisc., a Corporation of Wisconsin. An object of the invention is to provide a machine for cutting and stripping covered wire and for automatically severing wire stock into successive pieces of predetermined length. The arrangement of the knives is such that they will strip the insulation from both ends of the severed wire at the same time.

Reissue No. 17,820, WIRE FABRIC, Reissued Jan. 6,1931, to Hyman Tampkin, Brooklyn, N. Y. The invention relates to wire fabric, such as is used in bed, couch and similar construction. Two types of wire links are employed.

No. 1,789,091, APPARATUS FOR JOINING WIRES, Patented Jan. 13, 1931, by Stuart Williamson, London, Eng., Assignor of One-Half to Colin Martin Williamson, London, Eng. This is a tool intended for the purpose of twisting together the ends of wires, particularly in small spaces, such as junction boxes, and the like.

No. 1,789,154, SPRING MATTRESS, ETC., Patented Jan. 13, 1931, by David T. Owen, Cleveland, O., Assigner to The Owen Automatic Spring Mach. Co., Cleveland, O., a Corporation of Ohio. The inventor employs spiral wire sprinsg having open coils, the terminal portion of each coil being rigidly connected to the end coil of one or more adjacent springs, preferably by means of metal clips, by indenting the clips and wires.

No. 1,789,358, TESTING DEVICE FOR COIL WINDING MACHINES, Patented Jan. 20, 1931, by Clem H. Franke, La Grange, Ill., Assignor to Western Electric Co. Inc., New York, N. Y., a Corporation of New York. By the use of this device, electrical characteristics of a coil may be determined during the winding operation. In accordance with one embodyment of the invention, a portion of the chuck or core receiving member of a coil winding machine is suitable insulated from the framework and is provided with a number of wire retaining and electrical contact members which are electrically connected to a metal rim or commutator ring formed on the periphery thereof. A brush is provided for contact with the ring.

No. 1,789,709, MACHINE FOR FLUXING AND COATING ELECTRICAL CONDUCTORS, Patented Jan. 20, 1931, by Lora E. Poole, Anderson, Ind., Assignor to Delco-Remy Corp., of Dayton, O., a Corporation of Delaware. One object of the present invention is to facilitate the preparation of the armature conductor leads for soldering to the bars of the commutator. In the present instance this object is carried out by a machine for fluxing the ends of the armature leads and for coating the ends of the leads with another metal such as tin to facilitate soldering.

No. 1,789,881, MACHINE FOR MAKING INSULATED WIRE, Patented Jan. 20, 1931, by Beauford H. Reeves, New Haven, Conn., Assignor to Rockbestos Products Corp., New Haven, Conn. The invention covers a machine for placing insulation about wire conductors, the insulation consisting of loose, untwisted rovings, wound upon the conductor in a new manner and then bound together with a binding compound, compressed, and smoothed into a dense mass of intermingled fibres.

Old Mine Cables Form Highway Guards

The practice of using wire ropes and posts as guards at dangerous points on highways first was adopted in Pennsylvania, when lack of State funds precluded purchase of other types of safety fences and forced the State's first highway commissioner, Joseph W. Hunter, to make use of discarded mine cables.

The idea worked so well in practice that, after improvement in design, it was adopted as standard by Pennsylvania and several other States.

More than $800,000 was spent for this type of safety guard in Pennsylvania during the last fiscal year, 534 miles of cable being mounted on 150,000 posts, it is stated.

THESE MACHINES FIL

Sleeper & Hartley TRADEMARK
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The Spring-maker, the Wire Mill Superintendent, and t Elect
Drawing, Wire Coiling, Wire Winding, or Wire Forming fie ampl

Here are enumerated newly developed machines with specialized
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SPECIAL SPRING COILING MACHINES
FURNITURE SPRING COILING MACHINES
HELICAL BED SPRING CUTTING AND HOOKING MACHINES
RING COILING MACHINES
FLAT RING COILING MACHINES
SPRING GRINDING MACHINES
SPRING HOOKING MACHINES
SPRING SETTING MACHINES
SPRING KNOTTING MACHINES

SPECIALIZED SPRING MACHINES

BEARING SPIRAL COILING MACHINES
LOCKWASHER COIL AND CUT MACHINES
REINFORCEMENT COILING MACHINES
RECTANGULAR SPRING WINDING MACHINES
DOUBLE-BODIED TORSION SPRING MACHINES
TOY & TOP TORSION SPRING MACHINES
PERFECTION DOORSPRING MACHINES
CLUSTER ROLL COILING MACHINES
EDGEWISE COILING MACHINES
WIRE SPIRALLING MACHINES

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TINNING & GALVANIZING FRAMES
PICKLING HOUSE EQUIPMENT
TAR-LINED TUBS, REELS, ETC.
ROLLING & FORMING MILLS

MACHINES FOR ELECTRICAL PLANTS

ARMORING MACHINES FOR WIRE, CABLE, ROPE, HOSE, BX, OR HOLLOW CONDUIT
FLEXIBLE CONDUIT & CASING COILING MACHINES
FLEXIBLE TUBE COILING MACHINES
TUNGSTEN FILAMENT COILING MACHINES
WIRE ENAMELING MACHINES
RESISTANCE ELEMENT COILING MACHINES
SPECIAL DESIGN MACHINES

NAIL AND FASTENER MACHINES

UNIVERSAL WIRE NAIL MACHINES
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POWER-DRIVEN REELS OF EVERY TYPE
TILTING REELS FOR WIRE OR FLAT STRIP
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JAPAN—Andrews & George Co., Tokyo

Standards Set for Galvanized Wire

THE American Society for Testing Materials, following a favorable vote by the society's membership at the last annual meeting, advanced to standard six tentative specifications relating to galvanized wire and wire products. Also, standard methods of determining weight of coating on zinc-coated articles (A 90-24) has been revised (A 90-30) to include an improved method for determining the weight of coating on zinc-coated wire. Following are the specifications, published as tentative in 1927 and 1928 for galvanized wire and wire products, which have been adopted as standard:

A 111-30—Zinc-coated (galvanized) iron or steel telephone and telegraph line wire.
A 112-30—Zinc-coated (galvanized) iron or steel tie wires.
A 116-30—Zinc-coated (galvanized) farm-field and railroad right-of-way wire fencing.
A 117-30 — Zinc-coated chain-link fence fabric galvanized after weaving.
A 121-30—Zinc-coated (galvanized)
A 122-30—Zinc-coated (galvanized) steel wire strand.

In the above specifications the Preece test is recommended for determining only the uniformity of the zinc coating, while stripping tests are provided for weight of coating determinations. In the specifications for line wire and tie wire, wrap tests have ben provided which may be specified by the purchaser as a check on the flexibility and adherence of the zinc coatings. The specifications cover materials regularly obtainable in the open market, and have been prepared by the society for the mutual benefit of purchaser and seller.

Chain link fence fabric (A 117-30), widely used for the manufacture of chain-link fence, is resilient and develops high strength under impact and stretching. Prior to 1925 most chain-link fabric was formed from galvanized wire, but about that time several of the larger fence companies more or less simultaneously undertook development work to improve the weather resistance of this type of fence. The outcome of this development work was the introduction of galvanized after-weaving chain-link fence fabric. This new type fabric carries considerably heavier zinc coatings than did the older type.

The specification zinc-coated steel wire strand, A 127-30, contains one or two important revisions. Probably the most important is the one which specifies maximum and minimum diameters of the individual wires of the strand instead of permissible variations from the diameter of the completed strand. A requirement was added pertaining to the lay of the strand which specifies a length of lay not to exceed 16 times the nominal diameter of the strand in inches.

The new method for determining the weight of coating on zinc-coated wires (A 90-30) may be more conveniently and economically performed and with considerably greater accuracy than was possible with the former method which involved reference to a table, and required the selection of very short lengths of wire for the more important gages. The new method specifies that the sample of wire may be any length over 12 in., but preferably about 24 in. This method does not require the use of samples of known length since, using 0.283 lb. per cu. in. as the density of steel, it is only required to determine the diameter of the stripped wire and the ratio of the weight of the coating to the weight of the stripped wire. Expressed as a formula:

Ounces of zinc per sq. ft. of stripped wire surface=163 dr where
d=Diameter in inches of stripped wire
and

$$\frac{\text{Original weight minus stripped weight}}{\text{Stripped weight}}$$

Exposition Shows Rise of Industry

An exposition, "Man and Machines", has been opened at the Museum of the Peaceful Arts, News Bldg., 220 E. 42nd St., New York. This demonstrates the changes in economic and social life caused by the industrial revolution and modern use of machinery. Mechanical devices and tools, ranging from stone age instruments to complicated engines of 1930, motion pictures, photographs, working models, graphs, diagrams and pictures will be employed to tell the story of the machine age of today.

Professor Charles R. Richards, vice president of the Museum, explained that the exhibit has three aims, the first of which is to present the chief physical agencies of the new machine age, with particular emphasis upon the growth of metallurgical science and the development of power and machine tools. The second is to illustrate the most significant of the industrial advances brought by these agencies, and the third is to indicate the social and economic significance of technological advances.

Among the wire and other companies and individuals who are preparing material for the exhibition are the following:

Amer. Electric Railway Asso.
Amer. Inst. of Steel Construction.
Amer. Steel & Wire Co.
Amer. Tel. & Tel. Co.
Baird Machine Co.
Bakelite Corp.
Bell Telephone Lab.
Brown & Sharpe Mfg. Co.
The Bullard Co.
The Carboloy Co.
Farrell-Birmingham Co.
Henry Ford.
International Harv. Co.
Hoskins Mfg. Co.
Nat. Machine Tool Builders' Asso.
New Departure Mfg. Co.
Norton Co.
Otis Elevator Co.
Packard Motor Car Co.
RCA-Victor Co. Inc.
Remington Rand Inc.
Rivett Lathe & Grinder Corp.
Rockford Drilling Machine Co.
John Royle & Sons.
Taylor-Wharton Iron & Steel Co.
Union Carbide & Carbon Corp.
Westinghouse Lighting Inst.

Exports and Imports of Wire

Exports or iron and steel wire products in November and December, 1930
(In gross tons)

Items	November 1930	November 1930	December 1929	Year through December 1930	Year through December 1929
Wire rods	2,543	3,013	3,056	39,777	42,251
Hoops, bands and strips	2,125	1,824	5,207	39,315	70,864
Plain Wire	1,985	1,689	3,275	26,480	45,505
Barbed wire and woven wire fencing	2,473	1,842	4,397	39,093	64,478
Woven wire screen cloth	81	84	113	1,600	1,667
Wire rope	227	270	375	4,536	6,958
Insulated wire and cable	20	74	63	528	1,076
Other wire and manufactures	393	462	630	7,456	10,382
Wire nails	781	608	806	8,468	12,987
Nails other than wire	216	452	587	5,435	9,582
Tacks	24	43	55	446	674
Bolts, nuts, rivets, except track	533	693	1,479	10,134	16,235
Totals, these 12 classifications	11,401	11,054	20,043	183,268	286,659

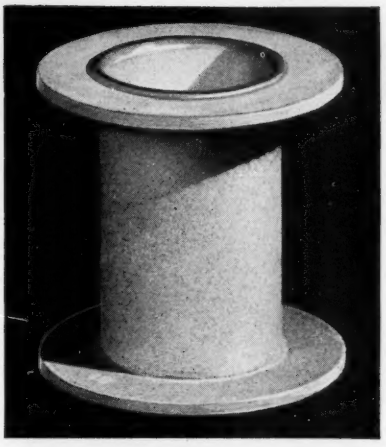
Imports of iron and steel wire and wire products into the United States
(In gross tons)

Wire rods	582	684	1,039	8,842	15,653
Concrete reinforcement and other bars	1,565	7,230	2,805	48,390	38,220
Barbed wire	279	377	544	4,674	5,999
Round iron and steel wire	216	115	476	4,234	5,825
Steel telegraph & telephone wire	3	2	0	49	26
Flat wire and strip steel	37	41	154	1,098	2,175
Wire rope and strand	195	180	222	2,593	2,451
Hoops and bands	1,587	1,777	1,563	23,057	42,145
Other wire	3	35	63	370	498
Nails, tacks and staples	711	479	740	6,013	9,334
Bolts, nuts, rivets and washers	7	37	74	348	429
Totals, these 11 classifications	5,185	10,956	7,680	99,668	122,755

FOREIGN trade for the month of December was almost 10,000 tons less than November, closing the year 1930 with more than a million tons less than in 1929 and half a million below the average for the past 5 years. In the wire field, while wire rods for December were even with the previous December the year shows a falling off of nearly 3,000 tons. Hoops, bands and strip were down in December 3,800 tons, but for the full year the exports were approximately half of 1929. Similarly, all of the other wire items showed small losses for December, but very large losses for the full year.

Imports in December did not show quite the large losses for November the difference being but 2,000 tons less. Steel ingots showed an increase for the month although down 15% for the year. Other bars showed a large increase for the month and an equally large increase for the year. As a matter of fact concrete reinforcement bars, hollow bars and drill steel and merchant steel bars taken together showed more than 48,000 tons in 1930 compared to 38,000 tons in 1929. Practically all of the other wire units show the same tendency, slightly smaller imports in December as compared with the previous December and rather large decreases for the full year.

Receipts of card clothing totaled 10,553 square feet ($16,176)—10,201 square feet (15,623) originating in the United Kingdom. Imports of wire cloth and screening increased to 24,204 square feet, the trade being divided between Germany, Canada, and France. Receipts of fourdrinier and similar wires rose sharply to 16,817 square feet, 15,315 square feet coming from Sweden and the rest from Germany. Imports of wire fencing and netting dropped to only 4,242,225 square feet, the trade being divided between the Netherlands, Germany, and Belgium on an almost equal basis. Wire heddle receipts rose to 2,802,000 pieces, 2,176,000 of which came from France. Wood screw imports again rose, this time to 17,518 gross valued at $2,030—Sweden supplying 16,370 gross ($1,817) and Czechoslovakia 1,148 gross ($213).



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We are now prepared to offer the reel which the Magnet Wire Division of the Wire Association has been seeking for years. It is not an experiment, for this type of reel has been manufactured in England for years, and is used almost exclusively there by 90% of all wire manufacturers. This reel is being manufactured under a special license protected by patent, and we are the exclusive licensee for both the United States and Canada.

Write for information

Write us for full specifications of this reel. We will be glad to furnish you with complete information regarding sizes now available, and will furnish samples to demonstrate our principle of construction. In asking for quotation, please submit sample, if possible, or let us have the following information: Quantity desired, overall dimension of the flanges, inside measurement between flanges, outside diameter of drum, diameter of bore, and gauge of wire to be wound on the drum.

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PRACTICALLY INDESTRUCTIBLE
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New Wire Machinery

Description of Recently Developed New Tools of Interest to the Wire Industry

P. I. V. Variable Speed Transmission

What is said to be the first all-metal variable-speed transmission on the market has recently been announced by the Link-Belt Co., Philadelphia. It is called the P. I. V. gear, the initials standing for "Positive Infinitely Variable", indicating its characteristics. Basically, this new speed change unit consists of two pairs of wheels of the opposed conical disc type, between which a unique chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired r. p. m.

Variable-speed devices employing adjustable conical discs and belts with side friction contacts have been used for some time. The wholly original feature of the P. I. V. gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to positively engage the radial teeth of the discs.

The chain used in the P. I. V. gear is made up of a series of steel leaves or links with joints consisting of hardened steel pins turning in segmental bushings. There are no teeth on the inner surface of this chain. Instead, what may be called teeth are made up of packs of hardened steel laminations or slats which extend through slots in the links at right angles to them, and project about ⅛ in., at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links, but, within each such container, the slats are free to slide from side to side individually with relation to each other and adjust themselves to engagement with the radial teeth of the discs, over substantially the full range of diameters. The angle of the slat ends, 30 deg., is the same as that of the conical faces of the wheels.

The teeth of the discs widen from the center outward toward the circumference, but are of uniform depth. They are so staggered relatively on each pair of wheels that the slats move back and forth into the teeth to mesh correctly as the chain comes into contact with the wheels. Self-pitching of the chain to any tooth width or wheel diameter is thus assured. At each engagement of the chain and wheels, the slats are regrouped within their separate containers, but do not slide nor move under working pull. Their movement in engaging with the wheels is complete before the load is applied.

All elements of the P. I. V. gear are built into and protected by a compact oil-tight housing, and are automatically splash lubricated. The hardened steel wheel faces are mounted on cast iron hubs backed by ball thrust bearings, and move axially on the shafts, which in turn are mounted in radial ball bearings. The movement of the pairs of wheels together or apart, in order to increase or decrease their effective pitch diameters, is controlled by a pair of pivoted levers operated through a hand control shaft with right and left-hand screw motion. Initial chain tension is provided for by an external adjustment screw, and correct operating tension is maintained at all ratio settings, by two hardened shoes which ride lightly on both upper and lower strands of the chain, under constant spring pressure. A speed indicator permits ready check-up on operating speed settings.

The P. I. V. gear has been put into production in five sizes, from 1 to 10 h. p., capacity, providing speed change ratios up to a maximum of 6 to 1. It has been thoroughly tested throughout the past year by continuous operation in driving machine tools, textile equipment, baking, glass and paper-making machinery. In these services it has proved wholly dependable and efficient, and by reason of its compactness and large range of speed variations, it has made possible desirable improvements in the design of several types of machines.

Automatic Control of Rolls

Six automatic screw-down controls for providing proper adjustment of the rolls in a rolling mill have been manufactured recently by the Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., for installation in a steel mill in Chicago. In rolling steel through a mill, the ingots naturally become smaller at each passage through the rolls, and, consequently, the rolls must be brought closer together. Formerly it was necessary to have an operator make the adjustments manually after each passage of the ingot through the rolls; but, with the automatic control, unpredetermined amount of "screw-down" or reduction of the distance between the rolls is arranged for by plugging in leads at certain points and, when the mill is in operation, this screw-down is provided automatically at the correct intervals.

Using this apparatus, one man can operate the entire mill. When the work is ready to begin, he simply throws a pass master switch, which starts the screws turning for proper adjustments for the first pass. Sights indicate when everything is ready. After the beam of iron or steel has passed through the mill, the operator moves the pass master switch to the second position—and so on. By throwing the switch to the off position the operator may resort to manual control at any time.

As screw-holder is rotated, its sliding contact meets the spirally-mounted contacts on the stationary Micarta panel, energizing the cir-

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WIRE DIE WORKS

Our dies are guaranteed against breakage on soft wire.

Weights guaranteed as stamped on blanks and marked on invoices.

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The large stock we are carrying,

Enable us to take care of the most particular requirements.

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MICROMETER PRECISION MICRO-WELD TRADE MARK

Two models of MICRO-WELD with capacities from No. 20 wire to 5/8-inch rods will take care of your butt-welding work BETTER—FASTER—AND AT LESS COST!

Greater efficiency—new design—new ideas in construction—more capacity for work—much lower price—these are the reasons why you should hurry to learn all about MICRO-WELD.

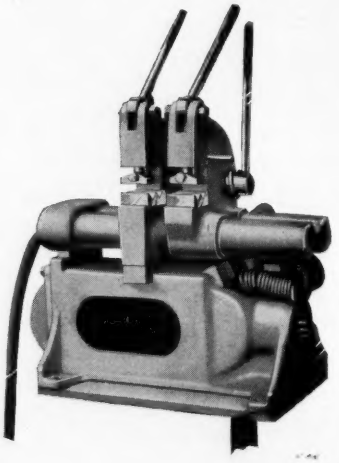
MODEL E (NOT SHOWN)
SELLS FOR $175.00.
(2½ kw. capacity — welds wires from No. 20 to No. 4 — perfectly.)

MODEL T (SHOWN HERE)
SELLS FOR $275.00.
(7 kw. capacity—welds stock of all shapes from ¼ to ⅝ in.—any metal.)
Slightly lower size limits on copper and aluminum.

We Also Make Spot Welders For All Requirements.
Write Us For The Complete MICRO-WELD Story.

WAIT!

We Will Shortly Announce a New Micro-Welder For Copper. Write Us For Early Details.



The MICRO PRODUCTS COMPANY
140 Industrial Street, Dept. 12,
Peoria, Ill., U. S. A.
European Office: H. A. Schlatter & Co.
Kusnacht-Zurich, Switzerland

cuit that provide the correct spacing between the rolls of the mill. The automatic screw-down is an example of eliminating the uncertain human element from industry and assuring the unvarying precision and uniformity required. It has proved that it can very successfully take care of that task in operating the mill to which it has been assigned; and it may be an indication that the operation of entirely automatic steel mills is a future possibility.

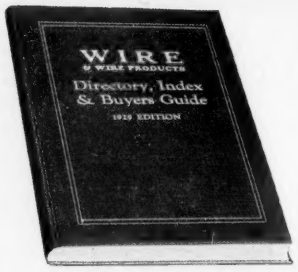
Screw Machine Products Huge in Value

Total shipments or deliveries of screw machine products and wood screws in 1929, by manufacturers in the United States engaged primarily in the production of these, total $83,266,678 an increase of 66.5% over 1927. Of this total wood screws were valued at $9,726,556 These same items as secondary products by establishments in other lines were valued at $50,009,983 in 1927, but the 1929 figures are not yet available.

Wire Cloth Under Corrosive Conditions

In large electrolytic copper refineries Monel metal wire cloth is used in the gravity nitration of slimes from the tank bottoms. Half inch mesh Monel metal wire cloth is also used in the sides of centrifugal extractor baskets in which crude nickel sulphate is separated from the concentrated sulphuric acid from which it is precipitated. This crude nickel sulphate is also washed in these same baskets. The baskets last about 6 months. This is considered a long life under such severely corrosive conditions.

Western Electric Co., Point Breeze, Md., has its largest armoring machine for wire armored cable in full operation on rush orders. The machine is 162 ft. long and occupies 3,240 sq. ft. of floor space.



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Of The Wire Association

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Greatly enlarged and improved, and combined with the Year Book of the Wire Association, it is the only complete and up-to-date Buyers Guide for the wire industry.

IT TELLS WHERE TO BUY

Bare and Covered Wire in All Metals
Machinery, Supplies and Equipment for
Wire Drawing Mills and Insulated Wire and Cable Plants
Formed and Fabricated Wire and Wire Products

Over eight hundred classifications, alphabetically arranged, cover everything used in making and forming all kinds of wire. Listings range from Abrasives to Zinc Wire.

World Wide in Scope

The following additional information is included in the 1931 edition:

1. A complete directory of **Canadian** wire drawing and wire fabricating and forming plants.
2. A complete directory of the wire drawing and fabricating plants of **England, Scotland, and Ireland.**
3. A complete list of **German** wire mills.
4. A complete list of **French** wire drawing and fabricating mills.
5. A complete list of **Belgian** wire drawing and facricating mills.
6. Lists of wire mills in other foreign countries.
7. Statistics of the wire industry.

Limited Edition—Price $5.00 per Copy

(Wire Association Members Receive a Copy Free as Part of Their Membership)

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MADE IN FRANCE

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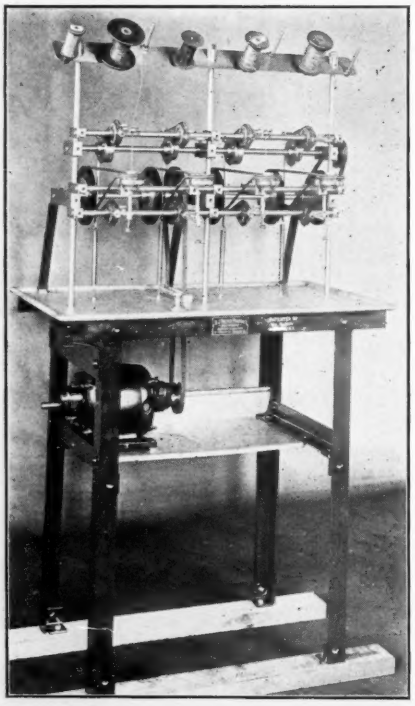
The Haddow Die Re-Cutting and Polishing Machine will lower your die re-cutting cost to a fraction of present costs



Recuts dies about ten times faster than by the needle and dust methods and with less diamond dust.

Any unskilled operator can learn to handle it quickly and efficiently.

ONE MONTH'S SHOP PRODUCTION

Total number of dies cut —1047

Total number of hours required—182.5

Average number of dies per hour—5.73

Number of operators—1

With only one man—This machine will do the work now requiring four to six men in less time and at lower cost.

4 HEAD MACHINE—Also Made in 6-Head size (With 2 Heads for Heavier Dies).

Fully Protected by Patents

For Information About Shop Rights

WILLIAM HADDOW
17 Eastern Ave.
Ossining, N. Y.

A New Market For Wire

(*Continued from page 90*)

many years only a few firms, among which were the Cream City Bedding Co., Milwaukee, and J. M. Hansen, proprietor of a modest bedding factory in Lake Forest, Ill., really displayed much confidence in the new mattress. Real interest in it has been displayed only for the last 10 years, and the past 5 cover the major portion of its climb to popularity.

Today every bedding manufacturer of any importance has an inner spring mattress in his line. Its popularity is increasing so rapidly that it bids fair soon to make all other types of mattresses take on the character of relics. It is distinctly **the** thing in a mattress. A conservative estimate places the annual production in the United States at 2,000,000.

The significance of all this to the wire industry is more or less obvious. When it is considered that the average inner spring construction consists of 280 coil springs, with four coils approximately 4 in. in circumference to each, a bit of mathematics reveals the fact that each such mattress contains no less than 370 ft. of steel wire. Add to this an additional amount used for tying the springs together, and you find a fairly sizeable consumption of material involved, on the order of 800,000,000 lineal feet each year. In weight, the average amount of steel wire used in such a construction is about 30 lbs. so the yearly total is 60,000,000 lbs. or 30,000 tons.

Among the larger producers of inner spring constructions in the United States are Burton-Dixie Corp., Hager Mfg. Co., Nachman Spring-Filled Corp., Peerless Springs, Inc., Simmons Co., Trenton Spring Products Co., and L. A. Young Spring & Wire Corp. The Burton-Dixie and Simmons companies make their own wire constructions for the use in completed mattresses of their own manufacture. The others are engaged solely in the manufacture of inner spring units, the units being purchased by firms who make the completed mattresses only.

These companies, while the

largest individual users of wire for the purpose, absorb only a portion of the total consumption. Of the approximately 2,500 bedding manufacturers in the United States, probably 200-300 have equipment for making their own springs and inner spring constructions. Statistics are not available as to the exact amount of wire they consume, but it is doubtless quite large.

Carried by the momentum of its inherent merit, this product has achieved vast sales during the recent years. The advertising of individual firms, as well as educational and promotional advertising sponsored by the trade association of the bedding industry, promise to increase this popularity until the inner spring mattress will become something every family "just simply must have". During the depression, while consumption of wire for practically every other purpose was considerably reduced, the amount used for bedding remained relatively steady. When industry as a whole experiences improvement, this outlet for wire promises to become a large and profitable one.

The Development of Wire Rope

(*Continued from page 89*)

9 to 10 tons. Now the factor of safety is generally calculated at a minimum rate of 6 : 1. That is to say that if the total static stress is 10 tons the rope should have a breaking strain of 60 tons. This would mean, say, a wire rope of 32 mm in diameter and about 175-190 kg. per sq. mm breaking strain. Now the so-called factor of safety is, in reality, a misnomer. It is calculated on the static stress only, without any regard to dynamic stresses, which dynamometer tests have sometimes shown to be momentarily as much as the static stresses.

Now to the question of lateral stress. If the rope were simply a solid bar of metal, lateral stress would play a very small role, but a rope is necessarily a delicate and complicated piece of mechanism made up of a number of strands, each made up of a number of wires, and, so that the rope may have a maximum of pliability, it is

The Standard for High Carbon Wire

English Brand Wire Drawing Soap

Proven efficiency by years of continuous use.

THE J. T. ROBERTSON CO., INC.

SYRACUSE, N. Y.

Wire drawing soap specialists since 1893.

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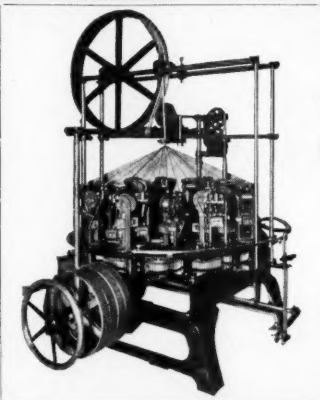
For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 22 years.

R. H. MILLER Co., Inc. Homer, N. Y.



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Multiple Head Wire Covering Braiders

Single, Double or Triple Deck Wire Covering Braiders

Single, Double or Triple Deck Cable Braiders

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WE SAVE YOU MONEY AND TIME

SOME ITEMS IN OUR STOCK

½" Shuster Straightener with 12' 0" Cut off.
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No. 1 Sutton Round Bar Straightener.
No. 1 and No. 2 Waterbury Farrel Triple Die Horizontal Swaging Machines.
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Draw Benches — Bull Blocks — Hot and Cold Rolling Mills.

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WIRE BUNCHING MACHINES
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TWINNING MACHINES Up to And Including SEVEN CONDUCTORS
(Manufactured under the Dawes Patents)

HASKELL-DAWES MACHINE CO., INC.
Ontario St. Below Trenton Ave.,
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EST. 1855 AIMCO INC. 1915
"American" AIMCO INSULATING MACHINERY COMPANY
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PHILADELPHIA PENNSYLVANIA U.S.A.

MANUFACTURERS OF (10)
MAGNET-WIRE ENAMELING MACHINES, COTTON, SILK, ASBESTOS, PAPER AND OTHER TAPE, WIRE INSULATING MACHINES

Complete Wire Tinning and Wire Electro-Plating Outfits.
Wire Saturating Equipment.
Wire-Respooling, Coiling and Wire-Reclaiming Machines.
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"Aimco" Panning Machines, Vulcanizing Pans and Patch-Vulcanizers for Rubber Covered Wire.
Pull-Out Capstans, Reel-Stands and Steel Reels.
High-Speed Wire-Drawing Machines.
SPECIAL MACHINES DESIGNED OR BUILT

given generally a core of vegetable fibre. The point is then that to resist lateral pressure better one must solidify, as much as one dare, both strands and core.

Bailing Ropes

This rope in Roumania, owing to the peculiar conditions of wire rope supply from abroad, which obtained until recently has suffered from over-standardization. Practically the one diameter that was being used was the 18 mm, and this was used in the 150-meter well at Bustenari and the 1,200-meter well at Moreni. Standardization and simplification are, within limits, the keynote of economy, but standardisation such as this is standardisation run amuck.

In 1927 9 mm rope was introduced for bailing shallow wells, and the author referred to one report he had received showing that the economy in electric power obtained by using a rope of this diameter exceeded the total cost of the rope; in other words, the expenditure on bailing ropes became less than nil. Undoubtedly, standardisation in wire ropes, within certain limits, is very desirable. Roughly something of the following nature would be a suitable scale:—

For wells up to 250 meters—9 mm diameter rope
For wells up to 500 meters—11 mm or 12 mm
For wells up to 750 meters—14 mm diameter rope
For wells up to 1,000 meters—14 mm diameter rope
For wells up to 1,500 meters—16 mm diameter rope
For wells up to 2,000 meters—20 mm diameter rope

Pump Ropes

Pumping has come to the forefront in this country recently, but so far little attention has been directed to the possibility of applying the wire rope to this branch of production. Probably the reason for this is that the pump manufacturer is invariably a manufacturer of rods but never of wire rope and naturally the more timid producer may be led by his pump suppliers never to use the wire rope. Furthermore, the first wire ropes applied to this work were of the bailing or drilling type—lines which are too flexible and have too much stretch. Some 6 or 7 years ago, however, non-rotating lines with

very little stretch in them were introduced for this work. Since then the use of the wire rope for pumping has increased enormously. The author referred to an article from the pen of Wallace Davies in the **Oil Weekly** of May 31 last to the effect that with the Burmah Oil Co. production is profitably carried out from wells of smaller productivity than anywhere else in the world.

The wells are grouped together into one power unit with which they are connected by sucker rod lines, and a number of wells have wire lines in place of rods. Here we have evidence that what appears to be the cheapest production in the world is done by pumps, some of which are worked with wire ropes. The author pointed out that some of the said ropes were supplied to a leading Co. by a certain manufacturer known to the author. Under date of Oct. 16, 1924 the said manufacturer received a letter from a firm in Burmah of which the following is an extract:—

"Stretch. One of our requirements was that there should be as little stretch in the rope as possible. The initial stretch in the line lasted a fortnight after which no further stretch has been evident.

"The following are the details:

On 26/5/24 stretch taken up on line was 5 feet
One 27/5/24 stretch taken up on line was 4 feet
On 28/5/24 stretch taken up on line was 2 feet
On 28/5/24 and 6/6/24 stretch taken up on line was 3 feet
14 feet.

"This being the stretch in 280 ft. only represents 6 in. per 100 ft. which is very low, and, far better than the old drilling lines that never stop stretching.

"Rotation. Another of our requirements was that the line should be as non-rotating as possible. To test this the usual swivel rope socket that has to be used with ordinary ropes and incidently causes a great deal of trouble as the sand wears them out very quickly and often causes a fishing job, was not used, but a solid non-swivelling socket was substituted for it. This causes no trouble and no instances occurred of the sink-

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Successors Royle & Akin
Fine Wire Manufacturers
OSSINING Established 1902 NEW YORK

Manufacturers of Fine Bare Wires
Copper Wire Specially Processed for Enameling Purposes

Copper
High Brass
Low Brass
Pure Tin
Cadmium
Bronze, Various Grades
Lead
Zinc
Commercial Bronze
Phosphor Bronze
Silver Plated Copper
False Gold

10%, 18%, 30% Nickel Silver

LAHN
False Gold Copper Silver Plated Copper

BRUSH WIRES CRIMP and STRAIGHT
Brass
Steel
Copper
Nickel Silver
Phosphor Bronze

Metallic Fibre for Packing Purposes

"PREMIER"
Trade Mark Reg. U. S. Pat. Off.

USERS REPORT:
—Less interrupted production
—Less repair work
—Less replacements

As wire drawers for over 30 years, your problems are ours. We have worked them out for ourselves and PREMIER dies made for your individual needs will work out your most difficult die job.

DRIVER-HARRIS COMPANY
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Cleveland *Alloy Makers since 1899* Italy

URDIKA
WIRE DIE WORKS, INC.
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STEEL SET
DIAMOND DIES
ALLOY DIES
ACCURATE SIZE
Smooth Draw Highest Quality

Metal Spools for Wire Drawing

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Metal Bound Spools for Shipping

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Hubbard Spool Co.

1620-32 Carroll Avenue

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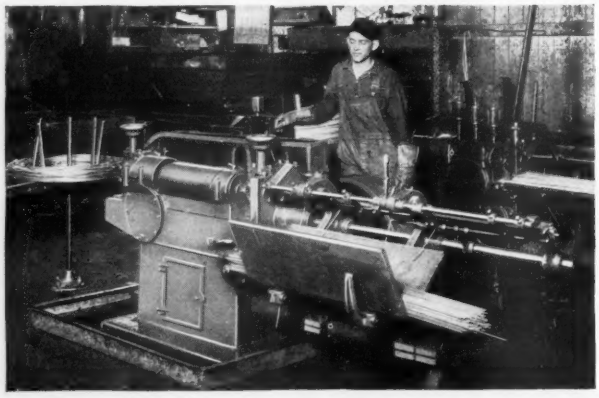
A SHUSTER

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE—MOTOR DRIVEN



cutting ¼" diameter Bessemer wire into 30-½" lengths for Hood wires in one of the largest motor car plants in the country.

In this plant they install only machines which stand up to constant service day after day, and that Shuster Machines do this is shown by their repeat orders.

May we tell you more about them?

The F. B. Shuster Company New Haven, Conn.

Straightener Specialists Since 1866

er bars or working valve becoming unscrewed.

"Flexibility. The rope fulfills our requirements of flexibility and has been spooled on the bull shaft once or twice daily without any damage done."

Last year the author wrote to the manufacturer to know how he was getting along in this new sphere of the wire rope industry, and under date of Sept. 10, 1928, received a letter in which was written "We are receiving more orders for pump ropes than we have ever done".

It must be borne in mind that the wire rope has the following advantages:

1. It is lighter.
2. It is cheaper.
3. It can be taken out and put back very quickly.

The theoretical objection to the wire rope is that it might cut the tubing, but there does not seem to be evidence that wire rope has proved more destructive in this respect than rods.

Wire Questions and Answers

(*Continued from page 95*)

reduction, and from Number 11 (.1205) to Number 12 (.1055) equals 15/1000 reduction. The inconsistency of reducing 15/1000 from Number 5 to Number 6 and from Number 11 to Number 12 suggested list Number 5 (.214) to Number 6 (.195) equals 19/1000 reduction and Number 11 (.115) to Number 12 (.102) equals 13/1000 reduction.

The Newark Wire Cloth Co., Newark, N. J., is now manufacturing wire cloth of stainless steel. This is made in all meshes, widths and lengths, and will be made as fine as 200x200 (40,000 openings per square inch) provided quantity orders warrant.

John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire rope has awarded a general contract to J. A. Reading, 315 Ardmore Ave., for one-story addition, to cost $40,000 with equipment.

From 1888 to 1903 I had all the high carbon steel wires drawn according to the list suggested, for music wire, clock spring wire, plow steel, etc., with very good results. If I can be of any use to you in any way I shall be pleased to offer my service at any time.

Catalog Reference to Gages. It is interesting to note the following which appears in the 1931 catalog of the Riverside Metal Company, Riverside, N. J.

GAGE

The adoption of the micrometer caliper to determine the thickness of metal or the size of wire in decimal parts of an in., and the **abolition of all gage numbers when ordering is strongly recommended.** This will prevent confusion, expense and loss of time.

All gage numbers applying to orders for phosphor bronze, nickel silver, commercial bronze and brass in the form of sheet, wire and rod, will be interpreted according to the American, or Brown & Sharpe's standard, unless otherwise ordered.

By specifying in decimal parts of an inch there is no uncertainty as to the thickness or diameter required.

For Example:

".07196 diameter" is definite and clear.

Whereas:

"13 gauge" could mean any of the following:

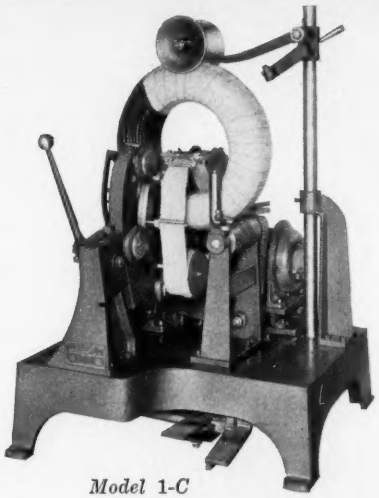
Gauge No. 13	.0915
American Brown & Sharpe's .07196	Imperial S. W. G. 092
Birmingham or Stubbs 095	London or Old English 095
Wash. & Moen	U. S. Standard .09375

Specifying in decimal parts of an inch eliminates uncertainty and delay in the proper execution of orders.

Konel Wire Gives Great Strength at Red Heat

A new metal, called Konel, has been produced by the General Electric Research laboratories. It is harder to forge than high-speed steel, is very tough at high temperatures, when most metals lose their strength. Engineers predict many uses for it, including the manufacture of valves and valve stems for gas or diesel engines. Another possibility is for turbine blades or structural pieces in modern power plants, where the steam temperature equals red heat and pipes and fittings glow visibly.

MACHINE WRAP And SAVE



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Write for Latest Catalog and See Why.

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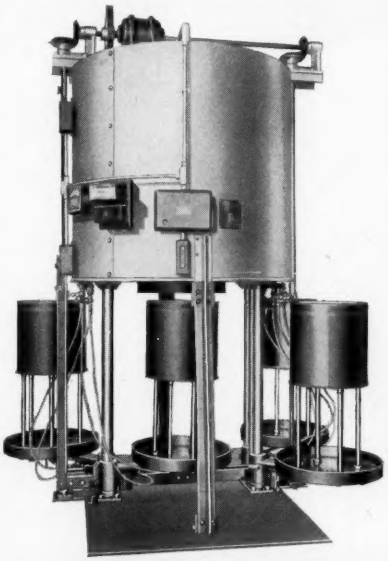

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For The Dry Bright Annealing of Non-Ferrous Wire (Spooled or Coiled) Small Tubing, Shells, Etc.

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WATERBURY, CONN.
Write for Bulletin 111W

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STANDARD FORGE FIRE-HAMMER WELDED

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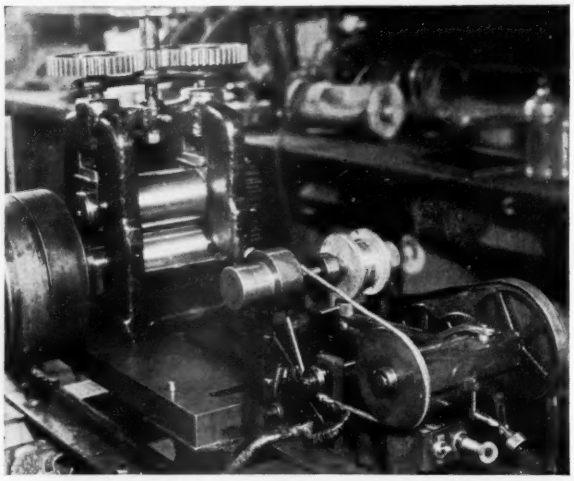
Columbiana Boiler Company
COLUMBIANA, OHIO

A striking and promising commercial use for red hot Konel is cutting "dry ice" (solidified carbon-dioxide gas) at soda fountains.

The new metal was originally developed as a substitute for platinum wire in radio tubes, and has been of great value in that application. Tubes with filaments made of the new metals are operated 175 degrees colder than tubes with platinum filaments but with the same emission, thereby giving much longer life and better reception results.

The new material is an alloy of nickel, cobalt and ferrotitanium.



Special Small Rolling Mill Used for Cold Rolling Konel Wire Rods.

Its name, Konel, is an abbreviation of cobalt (spelled with a K instead of a C) and nickel. It has an ultimate strength of more than 60,000 lbs. per sq. in. at 600 deg. C. (1,112 deg. F.), as compared with 48,000 lbs. for stainless iron at 565 deg. C., 39,000 lbs. for nickel at 532 deg. C., and 30,000 lbs. for chrome nickel steel at 500 deg. C.

It is an electric furnace product, being produced in extreme purity, and its extraordinary ductility is proved by the process of making radio filaments. For this use it is produced in 20 lb. ingots, forged, cold-rolled, drawn down through diamond dies to one mil thickness (1/100 in.), then rolled again to a ribbon of 0.002 05 in. wide, and 0.000 55 in. thick, the dimensions being held to within 5% variation. Of this fairy-like ribbon, 6 miles would make a pound.

Added to its other extraordinary qualities, Konel is extremely resistant to most acids, does not sputter, does not scale like iron under heat, and has a high electrical resistance. Its cost, in contrast with metals of comparable qualities, like platinum, or iridium, is extremely low. It is not difficult to imagine that with so unusual a collection of valuable characteristics, at a practicable price, it may be expected to figure in some remarkable developments of the future.

BELLET

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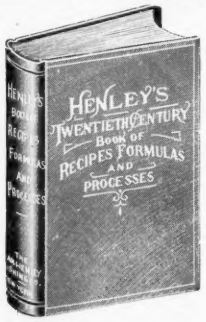

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551 Fifth Ave., New York, N. Y.

The Waterbury Wire Die Co.

Diamond, Composition and CHILLED IRON DIES
Waterbury, Conn.

Thermal Treatment of Wire

(*Continued from page 87*)

When this coarse-grained austenite is cooled it would transform into a coarse-grained ferrite, pearlite, sorbite, or martensite as the case may be. This coarse grain resulting from overheating would detract seriously from the quality of the steel, making it brittle, hence at every stage of steel manufacture, and especially in heat treatment care is taken to prevent overheating. In wire drawing, instead of being careful not to overheat, this is done deliberately.

The process of patenting consists, as we have seen, of heating the wire to a temperature well over the critical range, between 1500 and 1950 deg. Fahr. depending upon the composition, holding just long enough for the required grain growth to take place followed by a sufficiently rapid cooling to form sorbite. The cooling is usually in air; for some medium and high carbon steels, however, the wire passes from the hot furnace directly into molten lead maintained at 900 to 1500 deg. Fahr. This is known as lead patenting.

Now why does the wire manufacturer deliberately overheat steel which is to be drawn into high strength wire? Because this overheated steel even though brittle, draws better, and produces a more ductile and at the same time a stronger wire. The brittleness due to overheating is practically eliminated in the first draft. It is, of course, necessary to use great care in drawing this overheated wire until the brittleness is gone. The reason why a coarse grain is desirable is this: It is generally accepted that the longer the fiber in a cold-drawn wire the better it will withstand the torsion test. A patented rod with large grains will draw into a wire having long fibers. In microphotographs the structure of the threaded section of a streamline wire shows eqinaxed pearlite, while the structure of the swaged portion of the same wire shows elongated grains. It is also generally accepted that a wire with a relatively short fiber will withstand the bend test better that one with a very long fiber. This short fiber is produced by

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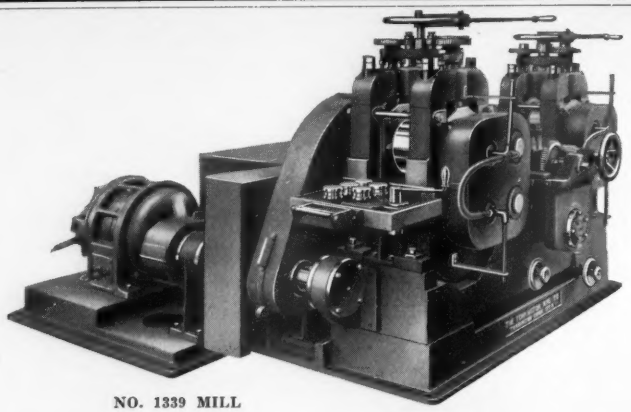

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cold working a rod with a somewhat smaller grain. It is not always easy to decide whether a short fiber or a long fiber wire is best; many wire manufacturers compromise and aim at an average between the two.

The next question that concerns us relative to the patenting process is why a sorbitic structure is so desirable. Adam gives a clear example of this. An 0.85% carbon steel rod was annealed at 1650 deg. Fahr.. and cooled slowly in the furnace. Another specimen was patented at 1925 deg. Fahr. and cooled in lead at 1100 deg. Fahr. The annealed wire broke when drawn two drafts to 10-gage wire; the patented specimen drew eight drafts to 17½-gage without failure. Annealed wire in the pearlitic condition is much inferior as regards its drawing properties than wire in which the structure is wholly sorbite. The sorbitic steel is much harder but is much more ductile as measured by its capacity to withstand cold deformation.

The reason for the great difference in drawing properties of a pearlitic steel as against a sorbitic steel is as follows: In the pearlitic condition the laminations of ferrite and cementite are extremely haphazard, varying widely in different grains. Thus in many grains the relatively large, hard, brittle plates of cementite are at right angles to the direction of flow and thus oppose it. In the case of sorbitic structure the particle size is very small, the cementite and ferrite are practically emulsified, hence slip occurs readily in all directions.

Lead patenting produces a more uniform structure than in the ordinary air-cooled product. This is due to the fact that it is exceedingly difficult to cool the wire in air without the formation of a little pearlite (if cooled to slow) or a little troostite (if cooled too fast). As representative of the physical properties of patented and drawn wire the following table from Adam is typical. The material was a 0.44% carbon, 0.82% manganese steel patented at about 1900 deg. Fahr. Much better physical properties can be obtained with higher carbon steels.

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ANNEALING FURNACES
Charles F. Kenworthy, Inc., Waterbury, Conn.

ANNEALING POTS
Columbiana Boiler Co., Columbiana, O.
Scudder, E. J., Fdry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

BAKERS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

BRAIDER CARRIERS
Mossberg Pressed Steel Co., Attleboro, Mass.

CASTINGS—Wire Mill
E. J. Scudder Foundry & Machine Co., Trenton, N. J.

CLEANING & PICKLING EQUIPMENT
Vaughn Machinery Co., Cuyahoga Falls, O.

CRANES—Wire Mill
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Chilled Iron
Waterbury Wire Die Co., Waterbury, Ct.

DIES—Diamond
Addor Wire Die Works, N. Y.
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N. Y.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Globe Diamond Die Corp., New York.
Koebel Wagner Diamond Corp., New York, N. Y.
F. Krause & Co., Inc., Jersey City, N. J.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Works, New York.
Waterbury Wire Die Co., Waterbury, Ct.

DIES—Composition
Addor Wire Die Works, N. Y.
Bellet Diamond Die Works, N. Y.
Urdika Wire Die Works, Inc., New York

DIES—Repairs & Re-Cutting
Addor Wire Die Works, N. Y.
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N. Y.
Cochaud Wire Die Corp., New York.
F. Krause & Co., Inc., Jersey City, N. J.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Wks., N. Y.

DIES—Recutting and Repolishing Machine
Wm. Haddow, Ossining, N. Y.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Detroit, Mich.
Master Wire Die Corp., N. Y.
Union Wire Die Corp., N. Y.

DIES—Tungsten Carbide
Bellet Diamond Die Works, N. Y.
Carboloy Co., Inc., Detroit, Mich.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.

DRAW BENCHES—
Scudder, E. J., Fdry & Machine Co., Trenton, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

DRIVES—V-Belt
American Pulley Co., Philadelphia, Pa.

FLUXES—Soldering
Kester Solder Co., Chicago, Ill.

FURNACE—Non-Oxidizing Annealing
Charles F. Kenworthy, Inc., Waterbury, Conn.

GALVANIZING ENGINEER
W. H. Spowers, Jr., New York, N. Y.

GALVANIZING—Hot
Wallace G. Imhoff Co., Vineland, N. J.

GALVANIZING LADLES, PANS, POTS
Columbiana Boiler Co., Columbiana, O.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

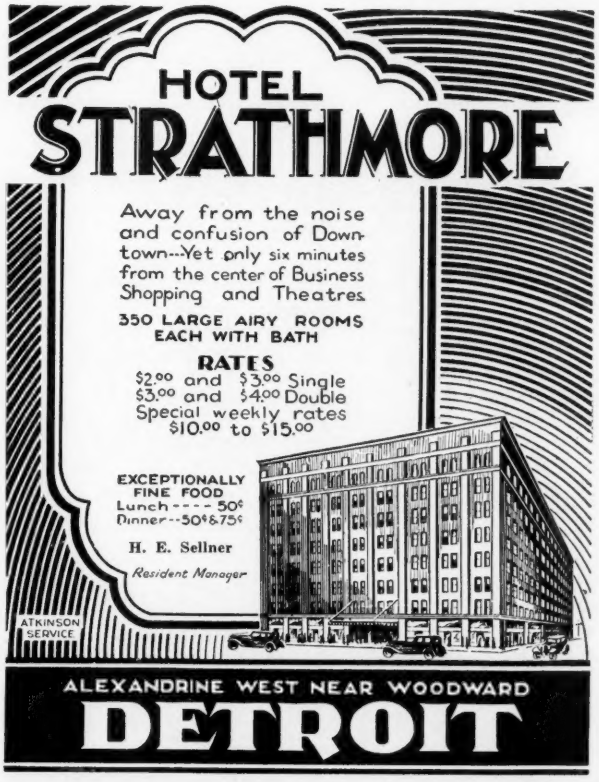
LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller & Co., Homer, N. Y.
J. T. Robertson Co., Syracuse, N. Y.

The Heat Treatment of Wire

The thermal treatment of wire, including hardening and tempering, is carried on for much the same reason that hot-rolled or machined products are heat treated—to improve the physical properties. One of the most common treatments applied to high strength wire is the so-called oil tempering. As this process is typical of the heat treatment of wire products it will be described briefly. The wire is passed continuously through a long narrow furnace where it is heated to the proper hardening temperature. It then moves into a long trough containing the quenching oil. This oil flows in at one end, out the other and then through a cooling system. From the oil quenching bath the wire passes into a lead tempering bath. The so-called oil tempering is a combination of hardening by quenching in oil followed by tempering in molten lead between 800 and 1100 deg. Fahr.

The physical properties of oil-tempered wire range from a minimum of about 170,000 lbs. per sq. in. tensile strength and an elongation of 10% in 10 in. for wire ½ in. in diameter to over 250,000 lbs. per sq. in. tensile strength and 1.00% elongation for wire 0.020



Professional Directory

Listing in the Professional Directory is recommended to all engineers, engineering and construction firms and consultants seeking business with wire mills or plants utilizing wire in any form.

W. H. Spowers, Jr.
Consulting Engineer
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Plants Installed Consulting Service
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to 0.050 in. in diameter. Oil-tempered wire is used extensively for springs. The average tensile strength of oil-tempered wire for springs is 180,000 to 200,000 lbs. per sq. in. with 3.00 to 6.00% elongation.

Most of the steel wire which is galvanized is low carbon and a large percentage of it is desired soft, with relatively low tensile strength and high ductility. There are a few products, however, which are made of high strength galvanized wire. Among these are rope and cable for use out of doors. For this reason we will look briefly at the effect of galvanizing on the strength and ductility of hard drawn high strength wire. Galvanizing takes place at a temperature of 900 to 950 deg. Fahr. As a rule the wire passes rapidly through the zinc kettle, sufficiently fast so that in many cases it does not get heated completely through its cross section. It does, however, get hot enough so that the strength and ductility of the wire are oftimes seriously affected. Galvanizing as ordinarily practiced has a deleterious effect in that it makes the wire brittle. The cause for this is not known, but the effect of this temperature (900 to 950 deg. Fahr.) on the properties has been throughly studied.

Passing a high strength wire through a galvanizing kettle reduces the ultimate strength and increases the elongation to a marked degree. But although the elongation is increased the brittleness as measured by the torsion and bend test is also increased. The reduction in torsion of a 0.60% carbon wire due to galvanizing is as much as 30%; before galvanizing wire which will withstand 44 torsions, afterwards will withstand only 30. For higher carbon steels the increase in brittleness is even greater. Adam found that galvanizing an 0.08% carbon wire reduced the torsion value 63%. In general then, we may say that galvanizing has a harmful effect upon the physical properties of high strength wire, making it more brittle. This characteristic should be taken into consideration when specifying that high strength wire should be galvanized.

BUYERS' GUIDE, Continued

MACHINE—Die Re-cutting and Polishing
Wm. Haddow, Ossining, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt. Co., Providence, R. I.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
Haskell-Dawes Machine Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
Haskell-Dawes Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Amer. Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Coiling
Broden Const. Co., Cleveland, O.
Haskell-Dawes Mach. Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrell Fdry & Machine Co., Waterbury, Conn.

MACHINERY—Cutting
American Insulating Mach'y Co., Phila., Pa.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing Wire
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Measuring Wire
New England Butt. Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
The Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rivet
Waterbury-Farrell Fdry & Machine Co.,

MACHINERY—Rod Drawing
Morgan Const. Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrell Fdry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
American Ins. Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Selson Engineering Co., Ltd., London, Eng.

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MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
American Insulating Mach'y Co., Phila Pa.
Haskell-Dawes Machine Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Company, Paterson, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrell Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Used
Crawford, F. H., Co., N. Y.

MACHINERY—Welding
Micro Products Co., Peoria, Ill.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington. Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wrapping Coils
Terkelsen Machine Co., Boston, Mass.

PACKING—Metallic Fibre
Hudson Wire Co., Ossining, N. Y.

POINTERS—Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

POTS
Columbiana Boiler Co., Columbiana, O.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PULLEYS AND SHEAVES
American Pulley Co., Philadelphia, Pa.

REELS AND SPOOLS—
American Pulley Co., Philadelphia, Pa.
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

REELS—Annealing
American Pulley Co., Philadelphia, Pa.

REEL AND TENSION STAND—
Sleeper & Hartley Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson Co., Syracuse, N. Y.

SOLDER
Kester Solder Co., Chicago, Ill.

SOLDER—Silver
Handy & Harman, N. Y.

SPOOLS—Wire and Cable
American Pulley Co., Philadelphia, Pa.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

WIRE—Various Kinds
Hudson Wire Co., Ossining, N. Y.

This is a carefully classified index of concerns who speci alize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

WATERBURY-FARREL

TANDEMS

No. 2 5-die machine, block type with stripper and optional floor spooler. Wire finished in coils or spooled, as preferred. Starting size 3/8 in. copper rod, finishing at No. 5 or No. 6 B. & S. gauge. Flexible - coupled enclosed herringbone drive. Anti-friction bearings throughout. Aluminum swing cover for dies.

THE CULMINATION OF MORE THAN 25 YEARS AS BUILDERS OF CONTINUOUS WIRE DRAWING MACHINES OF MERIT

The Waterbury Farrel Foundry & Machine Company

HOME OFFICE AND FACTORY:
Cottage Place, Waterbury, Connecticut
WESTERN SALES OFFICE:
Cleveland, Ohio

A machine that meets the present day demand for high speed and maximum production efficiency. The No. 2 machine is built in both 5 and 6-die constructions. The No. 1 tandem machine is built in from 5 to 10-die construction. May we send you our complete catalogue of wire drawing machinery?

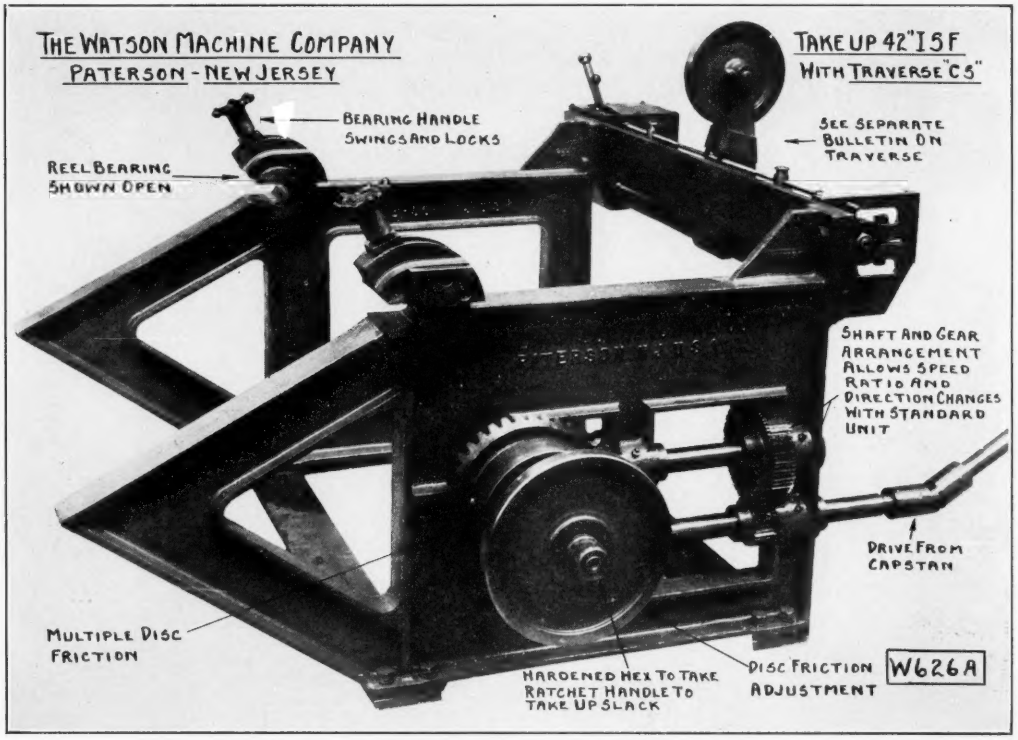
THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ENGINEERS - FOUNDERS - MACHINISTS

INCLINE FRAME TAKEUPS Type "I".


THE WATSON MACHINE COMPANY
PATERSON - NEW JERSEY
TAKE UP 42"I S F
WITH TRAVERSE "C S"
BEARING HANDLE SWINGS AND LOCKS
REEL BEARING SHOWN OPEN
SEE SEPARATE BULLETIN ON TRAVERSE
SHAFT AND GEAR ARRANGEMENT ALLOWS SPEED RATIO AND DIRECTION CHANGES WITH STANDARD UNIT
DRIVE FROM CAPSTAN
MULTIPLE DISC FRICTION
HARDENED HEX TO TAKE RATCHET HANDLE TO TAKE UP SLACK
DISC FRICTION ADJUSTMENT
W626A

Built standard in three sizes for 30", 42", and 60" maximum diameter reels.

Of heavy construction for heavy loads and pulls.

New Reel Shaft Lock, with no loose parts, quickly set.

Frame and drive design allows transferring to right or left hand unit and variation of drive ratio and direction at any time after completion.

Multiple Disc Slip Friction with adjustment easily accessible.

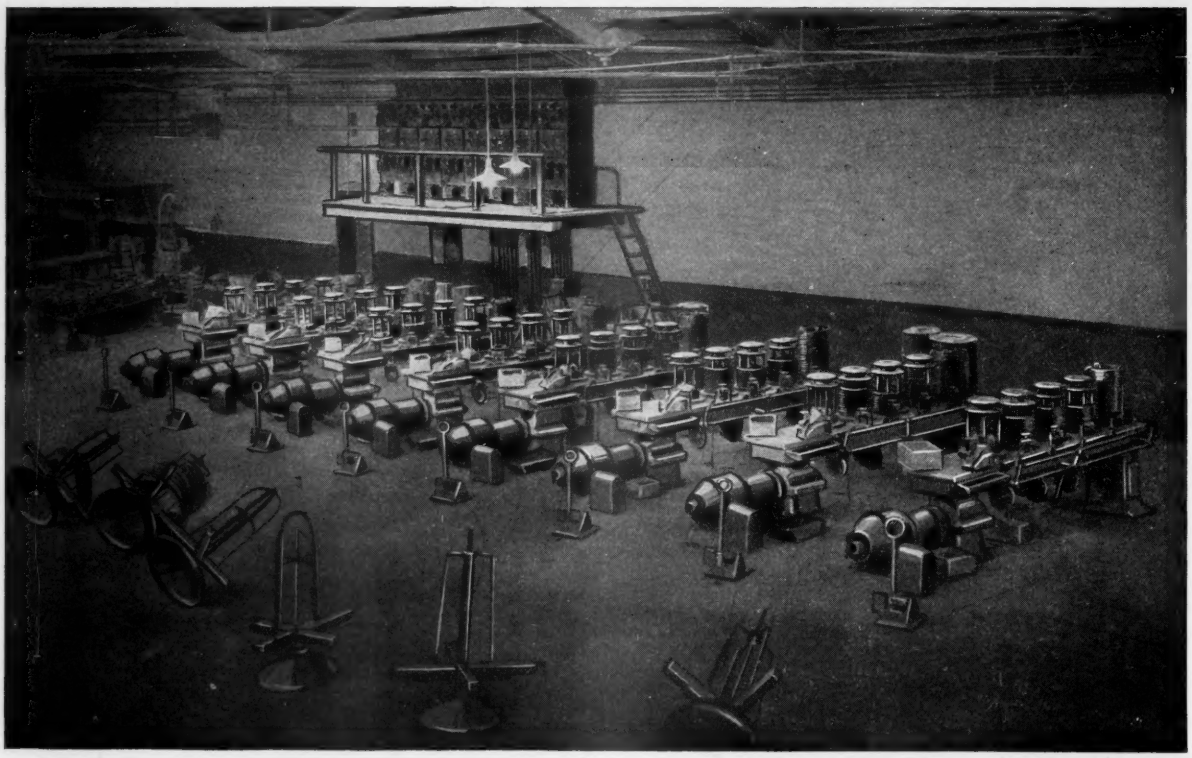
Slack Takeup Wrench in convenient position.

The Traverse is sturdy, with all adjustments made quickly and while Takeup is operating. Traverse "CS" is shown, but may be another type.

(See separate Bulletin.)

Standard Takeup Drive is for Universally Jointed Shaft from Capstan. eliminating hazard and cumbersomeness of belts or chains and loose Bearings on floor.

MORGAN
WORCESTER
ENGINEERS AND MANUFACTURERS



The net annual return on this investment is 61.4 per cent

MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS

MALMEDIE & COMPANY
Sole Licensee for Morgan-Connor Wire Machines in Europe
Maschinenfabrik Aktiengesellschaft — Dusseldorf, Germany